Natural Resources Program

An Addendum to the

NATURAL RESOURCES MANAGEMENT PLAN

for

Sequoia and Kings Canyon

SEQUOIA AND KINGS CANYON NATIONAL PARKS

January 1987 Revision

U.S. Department of the Interior National Park Service

NATURAL RESOURCES MANAGEMENT PROGRAM

An Addendum to the

NATURAL RESOURCES MANAGEMENT PLAN

for

SEQUOIA AND KINGS CANYON NATIONAL PARKS

JANUARY 1987 REVISION

Prepared by

Sequoia and Kings Canyon National Parks
National Park Service
Department of the Interior

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Natural Resources Management Program
Sequoia and Kings Canyon National Parks

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NATURAL RESOURCES MANAGEMENT PROGRAM

ABSTRACT

This 1987 revision of the Management Program (MP), an addendum to the 1981 revision of the Natural Resources Management Plan (NRMP) for Sequoia and Kings Canyon National Parks, proposes an expanded program. Also, this revision summarizes present status and identifies progress of projects proposed in the original NRMP and Environmental Assessment dated November 1976.

Several new projects, representing changes from the 1976 MP, are scheduled to be carried out in these Parks. Each new project is outlined in a Project Statement that serves as a blueprint for action, but Project Statements are not included for all projects listed herein. All Project Statement titles are listed in priority order along with a summary of costs required to carry them out in a revised Natural Resources Projects Programming Sheet. A five-year planning strategy for natural resources management, monitoring and research are presented in a section entitled Overview and Needs. A section on Interpretive Action to Support Natural Resources Management Programs has been added. This section describes how interpretation will be used to provide for public education and understanding and support of these Parks Natural Resources Management Programs and activities.

This (MP) will be reviewed annually, updated and revised as work is completed and new projects are proposed. Scheduling of projects will depend on availability of funds and overall priorities in these Parks.

OVERVIEW AND NEEDS

The natural resources of Sequoia and Kings Canyon National Parks are outstanding examples of the central and southern Sierran ecosystems. The primary natural resources which undoubtedly brought about National Park status were wilderness and forest vegetation, especially sequoia forests. These natural resources were cited in Acts establishing the area as Parks - the wisdom and rationale were sound. All of these Parks' natural resources are like building blocks, and the logical capstone is wilderness, pure and simple, many ecological factors working within a natural system unaltered by man. The sequoia forests are literally a wonder of the world, and nowhere do they exist as in the magnificent groves in these Parks.

The natural resources of these Parks are increasingly being threatened by air and water pollution from inside and outside these Parks. Wildfire, and man's use of these Parks also cause impacts. Acid precipitation and ozone will affect these Parks' natural resources well into the future. These threats alter the natural processes and ecological relationships. Unless the trends are mitigated or reversed, we will not be able to "perpetuate the natural ecosystems of these Parks so they may operate essentially unimpaired by human interference" and preserve these Parks for future generations.

All aspects of the Natural Resources Management Program were prioritized using criteria, in order, of (1) ecological integrity, (2) legal mandates (health and safety) and (3) prevention/mitigation of human impacts on the natural resources. Minimum standards, or the basic operating level, were also established for each of the major aspects of natural resources management. Minimum standards are identified in specific action Plans, such as the Fire Management, Bear Management, Aquatic/Water Resources Management, Stock Use and Meadow Management, and Bighorn Sheep Management Plans. The prioritized major aspects of natural resources management include:

1. Fire Management (reintroducing fire into park ecosystems)
2. Air Quality Monitoring
3. Vegetation Management
4. Bear Management
5. Water Quality Monitoring

6. Backcountry Management (mitigation of man's impact)

7. Aquatic and Wildlife Management

8. Cave Management

This Plan presents a five year strategy of natural resources management, monitoring, and research to solve the natural resource problems. The highest priority problems include mitigation of the wildfire threat by reintroducing fire as a natural process, particularly in sequoia groves, air and water pollution, and man's threat to vegetation, wildlife (particularly bears), and aquatic resources. Funding will be requested to bring the most important natural resources management programs to a minimum standard, basic operating level, prior to implementing new programs. All natural resources management problems identified so far are listed on the Natural Resources Projects Programming sheet.

Wildfire, a Threat to Park Resources

Fire Management is important for the protection of Park resources and visitors, and for the perpetuation of fire-dependent species such as the giant sequoia. The existing fire management program consists of: fire detection, presuppression, prevention, and suppression; allowing natural fires to burn; prescribed burning; and monitoring effects of prescribed fires. A research project funded to study fire ecology of chamise and other chaparral species was completed in FY85. Park base funds were established in FY87 for the preparation and execution of prescribed burns.

The Fire Management and Visitor Protection, Natural Resources Management, and Interpretive Divisions provide varying amounts of support to the program. A total of four permanent and 27 temporary employees are in the fire management branch. The majority of the program is concerned with fire suppression. Prescribed fire activities require a longer time commitment than do wildfires; trying to manage prescribed fire with emergency-oriented crews can lead to gaps in the management of these fires.

In FY84, Natural Resource Preservation Program (NRPP) funds were received, and a 10-person Natural Resources Management prescribed burning crew was hired. These funds, which were earmarked specificially for hazard fuel reduction burns in sequoia groves, expired at the end of FY86.

In FY87, $80,000 of Park base funds were set aside for prescribed fire activities. The new Park base for prescribed fire activities will fund prescribed burning and monitoring of all prescribed fires. The prescribed fire management team will provide sufficient personnel to give the fire management program the flexibility it needs to deal with the wildfire threat by conducting fuel hazard reduction prescribed burns. An increased level of monitoring will assure the objectives are being met. Also, increased monitoring will be essential as more of these Parks are placed in the Natural Fire Management Zone. More free burning fires will be allowed, all of which must be monitored. The increase in personnel will allow the fire management program to reach the operational level specified in the Fire Management Plan. This includes a gradual increase in the number of acres prescribed burned from the small acreage now being burned to approximately 2,000 - 5,000 acres annually within five years.

Background research studies will be conducted to understand the role of fire in the foothill woodland and mixed evergreen communities, as well as in the non-sequoia upper mixed-conifer and subalpine forest types, and the effects of fire on sensitive plant species.

Fire scar studies will be done to document the historical frequency, extent, behavior, and intensity of lightning-caused fire particularly in sequoia forests. However, in some areas, the results of these studies will be blurred by the historical presence of Indian-caused fires. Such studies are important guides in the definition of "natural conditions."

Mitigation of Bear/Human Interaction

The existing bear management program consists of a professional Fish and Wildlife Biologist and a Biological Technician (Wildlife) and two temporary Park Rangers. These personnel are responsible for wildlife and bear management and aquatic management. Bear management alone could be a full time job for several people during the summer. The number of bear incidents in 1983 decreased by five percent over 1982, by 30 percent in 1984 over 1983, by 67 percent in 1984 over 1985, and increased by at least 54 percent in 1986 over 1985, resulting in a total of 1,974 incidents and an estimated $174,454 in property damage in 1982, 1983, 1984, 1985 and 1986. Man's impact on bears must be mitigated if we are to preserve this unique species.

The proposed increase for the operational bear management and monitoring program consists of two temporary Park Rangers in two

areas in these Parks that experience severe bear and other wildlife problems. Funds received in FY84 and FY85 from the NRPP allowed bear-proof food storage lockers to be installed in campgrounds at Cedar Grove, Dorst, Mineral King, South Fork, Potwisha, and Buckeye. The ongoing bear research program was completed in FY86 and should provide valuable information on bear population dynamics.

Management of Vegetation in Developed and Backcountry Areas to Reduce Man's Impact

The existing vegetation management program includes detection and removal of insect infestations and diseased and hazardous trees from developed areas, assessing impacts of new Park developments on vegetation, and planning and monitoring of the above programs. Staffing consists of a Forestry Crew of one permanent Forestry Foreman, one Forestry Worker, six temporary employees and a Forester, a Forestry Technician, and one temporary Park Ranger that perform all monitoring activities. Removal of only the most hazardous trees and monitoring is accomplished annually.

Proposed increases for the vegetation management program concentrates on mitigating man's impact on vegetation of these Parks; including developing and implementing of revegetation/ landscaping plans for new Park developments; managing vegetation in developed areas; starting a vegetation restoration program in the backcountry for disturbed campsites, and implementing the Backcountry Management and Stock Use and Meadow Management Plans.

A monitoring technique for evaluating the ability of the Stock Use and Meadow Management Plan to meet its objectives was developed in 1985, and will continue to be tested in 1987.

The existing vegetation management program would be brought to minimum standards. Continuity would be provided to the program. This would include a vegetation staff, a Natural Resources Management Specialist, and support cost. A three-year research project will be conducted to determine the nature, history and management needs for preserving meadows, threatened and endangered plants and other unique ecosystems, and for rehabilitating heavily impacted backcountry areas.

Air and Water Pollution

The air and water quality monitoring programs are performed by the Environmental Specialist and the Fish and Wildlife Biologist. In FY86 the air and water programs received $22,800 and $16,900

respectively. These funds allow servicing and maintenance of existing air quality monitoring equipment to required quality assurance specifications. Air and water quality will be monitored around these Parks; baseline data can be obtained only during six months of the year at this funding level. Trends in air and water quality will be documented. The Aquatic/Water Resources Management Plan completed in 1984 outlines water quality monitoring needs in more detail.

The present air quality monitoring program has one (PLTFT) air quality monitoring position that maintains equipment and collects data. A 10-year research project, begun in 1982, will supplement these programs, establishing baseline data on the impact of acid deposition on park ecosystems.

Anticipated Accomplishments by Fiscal Year

FY87 - The air and water quality monitoring, and vegetation management programs will continue at the same level as in FY86. The prescribed fire management program will be base funded in FY87 for the first time. Increases will occur in the aquatic and wildlife management (particularly bear management) and vegetation monitoring programs.

No new natural resources management programs will start in FY87. The research project, measuring wet and dry acid deposition and its effects on aquatic and terrestrial ecosystems of these Parks, will continue in FY87. Other research ongoing from FY86 includes developing an ecological database; and assessing the effect of ozone on black oak, yellow pine, and giant sequoia. The only new research started will be the giant sequoia fire history/ecology study.

FY88 - The air and water quality program involves a constant monitoring of these Parks' air and water quality throughout the year. Baseline data and trends will be collected, and any significant deterioration and threat to resource integrity and visitor safety will be noted and corrective measures will be instigated if possible. The prescribed fire management, bear and vegetation (hazard tree removal), fire protection, vegetation monitoring, and aquatic and wildlife management programs will continue at the same level as in FY87. The only new natural resources management program will be the fencing of the North Fork of the Kaweah River area to trespass grazing.

The research project measuring wet and dry acid deposition and its effects on aquatic and terrestrial ecosystems of these Parks

will continue in FY88. Other research ongoing from FY87 will continue.

The only new research project will be studying the fire ecology of transition forests.

FY89 - Air and water quality monitoring will become a year-round program including ozone monitoring. The bear management and hazard tree removal programs will be brought to minimum standard. New programs include developing/upgrading natural resource management office facilities; operating the plant nursery; measuring the impact of people on backcountry lakes; and monitoring the extent of ozone injury to vegetation.

Research projects ongoing in FY88 will continue in FY89. New research studies will begin examining endangered and threatened species ecology, determining the feasibility of reintroducing bighorn sheep, increasing the base support for the research program, investigating cowbird invasion, and assessing air pollution threats to sensitive forest ecosystems.

FY90 - Air quality monitoring will continue at the same level as in FY88, except for a new program to monitor particulates and their effects on vistas and health. The water quality monitoring program will be at the same level as FY89. Some 5,000 acres of mixed-conifer and chaparral will be prescribed burned and monitored. Hazard tree removal and bear management will continue at the same level as in FY89. New programs to mitigate impacts of man to vegetation, manage fisheries, restore abandoned roads and trails, mitigate and monitor wilderness use impacts, monitor status of reintroduced bighorn sheep, monitor status of threatened and endangered fauna, clear vistas, and maintain bear lockers will be started.

New research studies will begin studying succession in montane meadows, determining the effects of fire on fauna, completing an inventory of aquatic resources, establishing long-term study areas, determining the ecology and distribution of exotic plants, completing an inventory of aquatic resources, studying the effects of acid precipitation on selected ecosystems, studying marmot behavior, starting a soil survey, assessing population dynamics of subalpine forests, and determining the feasibility of reintroducing the black-tailed hare.

FY91 - All natural resources management programs ongoing in FY90 will continue in FY91. New programs will include reestablishing the natural vegetation mosaic in campgrounds and developed areas,

naturalizing cut stumps and logs, controlling dwarf mistletoe, managing caves, controlling exotic beaver, evaluating the effects of the Mineral King dams, monitoring the effects of the Kaweah No. 3 water diversion, the impacts of developed sites, monitoring and managing deer, and studying the impacts of developed sites.

New research projects include studying the impacts of sewage on mid-Sierran streams, implementing floodplain studies in developed areas, starting sociological studies of Park visitors, and starting a fauna collection for the Park museum.

INTERPRETIVE ACTIONS TO SUPPORT NATURAL RESOURCES MANAGEMENT PROGRAMS

The Interpretive Division of Sequoia and Kings Canyon National Parks will take an active role in the Natural Resources Management Program of these Parks in a number of key activities. These include:

1. Informing Park visitors about ongoing natural resource management projects and problems in daily guided walks and evening programs, and at the information desk.

2. Preparing feature articles for publication in the Sequoia Bark interpreting these projects and problems to the Park visitors.

3. Actively monitoring sensitive species throughout the Parks and informing the Resources Management Division of any problems.

4. Developing interpretive evening programs that discuss prescribed fire, bear/human interactions, air and water quality problems, mitigation of human impacts on the environment, and minimum impact wilderness use.

5. Leading by proper example in minimizing human impacts on the natural resources of the Parks.

Park: Sequoia and Kings Canyon National Parks

Natural Resources Projects Programming Sheet

Date: January 1987

Proj. No.	Project Title	Proj. Type 1/	RMP Pri	Park Pri	10-237 No.	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
ON-GOING ONPS PARK BASE FUNDED ACTIVITIES/PROJECTS											
RM-1	Resources Management Administration and Supervision	Mit					83.4 (PB)	83.4 (PB)	83.4 (PB)	83.4 (PB)	83.4 (PB)
RM-3	Vegetation Management	Mit					122.7 (PB)	122.7 (PB)	122.7 (PB)	122.7 (PB)	122.7 (PB)
RM-3a	Vegetation Monitoring	Mon					53.4 (PB)	53.4 (PB)	53.4 (PB)	53.4 (PB)	53.4 (PB)
RM-7	Prescribed Fire Monitoring	Mon					27.1 (PB)	27.1 (PB)	27.1 (PB)	27.1 (PB)	27.1 (PB)
RM-8	Bear Management	Mit					43.1 (PB)	43.1 (PB)	43.1 (PB)	43.1 (PB)	43.1 (PB)
RM-8a	Bear Management (Ranger Activities)	Mit					99.3 (PB)	99.3 (PB)	99.3 (PB)	99.3 (PB)	99.3 (PB)
N-15a	Fire History/Ecology of Giant Sequoia Ecosystems	Res					32.5 (PB)	.0 (PB)	.0 (PB)	.0 (PB)	.0 (PB)
RM-26	Wildland Fire Protection	Mit					286.9 (PB)	286.9 (PB)	286.9 (PB)	286.9 (PB)	286.9 (PB)
RM-27	Fish and Wildlife Management	Mit					27.3 (PB)	27.3 (PB)	27.3 (PB)	27.3 (PB)	27.3 (PB)

Notes: 1/ Natural Resources project types are: Mit = Mitigation, Mon = Monitoring, Res = Research.

2/ Fund Sources should be shown in parenthesis after costs as follows: PB = Park Base, RNR = Regionwide Natural Resources Base, NRP = Servicewide Natural Resource Preservation Account, AQ = Servicewide Air Quality Account, AP = Servicewide Acid Precipitation Account, WR = Servicewide Water Resources Account.

Park: Sequoia and Kings Canyon National Parks

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Programming Sheet

Date: January 1987

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RM-27a	Creel Census Patrols (Ranger Activities)	Mit					24.3 (PB)	24.3 (PB)	24.3 (PB)	24.3 (PB)	24.3 (PB)
RM-29	Air Quality Monitoring	Mon					23.3 (PB)	23.3 (PB)	23.3 (PB)	23.3 (PB)	23.3 (PB)
RM-30	Prescribed Fire Management	Mit					80.0 (PB)	80.0 (PB)	80.0 (PB)	80.0 (PB)	80.0 (PB)
RM-40	Water Quality Monitoring	Mon					15.9 (PB)	15.9 (PB)	15.9 (PB)	15.9 (PB)	15.9 (PB)
RM-54	Bear Canister Development	Mit					12.0 (PB)	.0 (PB)	.0 (PB)	.0 (PB)	.0 (PB)
RM-56	Wilderness Management (Ranger Activities)	Mit					143.6 (PB)	143.6 (PB)	143.6 (PB)	143.6 (PB)	143.6 (PB)
RM-56a	Meadow Monitoring (Ranger Activities)	Mon					43.1 (PB)	43.1 (PB)	43.1 (PB)	43.1 (PB)	43.1 (PB)
RM-57	Backcountry Trail Restoration (Maintenance)	Mit					8.8 (PB)	8.8 (PB)	8.8 (PB)	8.8 (PB)	8.8 (PB)

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ON-GOING ONPS REGIONWIDE FUNDED ACTIVITIES/PROJECTS										
N-1	Base for Research (Parsons)	Res				90.8 (RNR)	90.8 (RNR)	90.8 (RNR)	90.8 (RNR)	90.8 (RNR)
N-1a	Base for Research (Graber)	Res				49.5 (RNR)	45.3 (RNR)	45.3 (RNR)	45.3 (RNR)	45.3 (RNR)
N-21	Development of an Ecological Database to Evaluate Impact, Management Problems, and External Influences on Park Eco-Systems	Res				58.3 (RNR)	41.5 (RNR)	41.5 (RNR)	41.5 (RNR)	41.5 (RNR)
RM-45	WRO Student COOP Resources Management Trainee Program	Mit				4.3 (RNR)	.0 (RNR)	.0 (RNR)	.0 (RNR)	.0 (RNR)
RM-58	Cyclic Backcountry Trail Restoration (Maintenance)	Mit				12.8 (CM)	12.8 (CM)	12.8 (CM)	12.8 (CM)	12.8 (CM)

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Park: Sequoia and Kings Canyon National Parks

Natural Resources Projects Programming Sheet

Date: January 1987

Proj. No.	Project Title	Proj. Type 1/	RMP Park Pri	10-237 Pri	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
ON-GOING NON-PARK/REGION BASE FUNDED ACTIVITIES/PROJECTS										
N-15a	Fire History/Ecology of Giant Sequoia Ecosystems	Res				30.0 (RNR)	30.0 (RNR)	30.0 (RNR)	.0 (RNR)	.0 (RNR)
N-27	Effects of Acid Rain on Vegetation and Aquatic Ecosystems	Res				98.8 (AP)	98.8 (AP)	98.8 (AP)	98.8 (AP)	.0 (AP)
RM-38	Monitor and Evaluate Ozone Injury on Vegetation	Mon				25.0 (AQ)	.0 (AQ)	.0 (AQ)	.0 (AQ)	.0 (AQ)
RM-38a	Ozone Monitoring	Mon				10.0 (AQ)	10.0 (AQ)	10.0 (AQ)	10.0 (AQ)	10.0 (AQ)
RM-51	Normal Year Fire Programming (FIREPRO)	Mit/ Mon				155.0 (FP)	155.0 (FP)	155.0 (FP)	155.0 (FP)	155.0 (FP)
RM-52	Dwarf Mistletoe Control	Mit				43.4 (FS)	29.8 (FS)	.0 (FS)	.0 (FS)	.0 (FS)
RM-53	Clover Creek/Red Fir/ Grant Grove Revegetation/Landscaping	Mit				63.5 (DSC)	60.0 (DSC)	60.0 (DSC)	.0 (DSC)	.0 (DSC)
RM-59	CCC Backcountry Trail Restoration (Maintenance)	Mit				28.8 (CCC)	28.8 (CCC)	28.8 (CCC)	28.8 (CCC)	28.8 (CCC)

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k: Sequoia and Kings Canyon National Parks

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Date: October 1987

j.	Project Title	Proj. Type 1/	RMP Park Pri Pri	10-237 No.	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
RRENTLY UNFUNDED PROJECTS										
-15	Fire Ecology/History in Giant Sequoia	Res	1 1.1		87-273	32.5 (PB) 110.0 (RNR) (NRP)	.0 (PB) 110.0 (RNR) (NRP)	.0 (PB) 130.0 (RNR) (NRP)	.0 (PB) 130.0 (RNR) (NRP)	.0 (PB) .0 (RNR) (NRP)
-42	Bring Natural Resources Management Programs to Minimum Standards 3/	Mit/ Mon	2 6.0	84-161		.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	194.5 (PB) 211.7 (PB)	194.5 (PB) 202.7 (PB)	194.5 (PB) 202.7 (PB)
-29	Acquire Natural Resource Information System	Res	3 5.0		87-270	.0 (NRP) .0 (NRP)	.0 (NRP) 88.0 (NRP)	.0 (NRP) 70.0 (NRP)	.0 (NRP) .0 (NRP)	.0 (NRP) .0 (NRP)
-28	Support for Long Term Research	Res	4 4.0	84-162		.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 33.0 (PB)	.0 (PB) 33.0 (PB)	.0 (PB) 33.0 (PB)
-12	Reintroduce Bighorn Sheep	Res	5 10.0		87-272	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 50.0 (RNR)	.0 (RNR) 40.0 (RNR)	.0 (RNR) 40.0 (RNR)
-43	Plant Nursery Operations	Mit	6	86-175		.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 25.0 (PB)	.0 (PB) 25.0 (PB)	.0 (PB) 25.0 (PB)
-46	Exclude Trespass Grazing and Control Road Erosion in Biosphere Reserve	Mit/ Mon/ Res	7 1.7/ 1.8		87-295/ 296	20.0 (PB) .0 (PB)	.0 (PB) 248.0 (NRP) 20.0 (PB) 2.9 (CMNR)	.0 (PB) 20.0 (PB)	.0 (PB) 20.0 (PB)	.0 (PB) 20.0 (PB) 2.9 (CMNR)

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Natural Resources Projects Programming Sheet

Date: October 1987

Proj. No.	Project Title	Proj. Type 1/	RMP Pri	Park Pri	10-237 No.	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
RM-44	Develop Facilities to Support Biosphere Natural Resource Programs	Mit/ Mon/ Res	8	3.1		87-271	.0 (NRP) .0 (NRP)	.0 (NRP) .0 (NRP)	.0 (NRP) 80.0 (NRP)	.0 (NRP) 80.0 (NRP)	.0 (NRP) .0 (NRP)
N-38	Fire Ecology of Transition Forests	Res	9				.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 24.0 (RNR)	.0 (RNR) 24.0 (RNR)	.0 (RNR) 24.0 (RNR)
N-13	Ecological Studies of Rare and Extirpated Species	Res	10	12.2		84-274	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 37.0 (RNR)	.0 (RNR) 37.0 (RNR)	.0 (RNR) 37.0 (RNR)
RM-12	Mitigate Impacts of Man to Vegetation 3/	Mit/ Mon	11	8.0	84-140		.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	53.4 (PB) 167.0 (PB)	53.4 (PB) 167.0 (PB)
N-34	Investigate Cowbird Invasion in SEKI	Res	12	8.0		86-289	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 25.0 (RNR)	.0 (RNR) 25.0 (RNR)	.0 (RNR) 25.0 (RNR)
RM-21	Monitor Backcountry Use and Rehabilitate Backcountry Sites	Mit/ Mon	13	11.1	86-174	87-299	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 25.0 (PB) 15.0 (CM)	.0 (PB) 25.0 (PB)
W-6	Measure Impact of People on Backcountry Lakes	Res/ Mon	14	12.1		84-263	.0 (WR) .0 (WR)	.0 (WR) .0 (WR)	.0 (WR) 23.0 (WR)	.0 (WR) 23.0 (WR)	.0 (WR) .0 (WR)
RM-38	Monitor Extent of Ozone Injury on Vegetation	Mon	15	6.0		84-266	.0 (AQ) .0 (AQ)	.0 (AQ) .0 (AQ)	.0 (AQ) 15.5 (AQ)	.0 (AQ) 15.5 (AQ)	.0 (AQ) 15.5 (AQ)

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3/ RM-12, Inc. includes Project RM-18 (Inc. 85-166).

Park: Sequoia and Kings Canyon National Parks

Natural Resources Projects Programming Sheet

Date: October 1987

Proj. No.	Project Title	Proj. Type 1/	RMP Pri	Park Pri	10-237 No.	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
N-30	Assess Air Pollution Threats to Sensitive Forest Ecosystems	Res	16	11.0		84-267	.0 (AQ) .0 (AQ)	.0 (AQ) .0 (AQ)	.0 (AQ) 54.0 (AQ)	.0 (AQ) 35.0 (AQ)	.0 (AQ) 35.0 (AQ)
RM-25	Restore Abandoned Trails and Roads to Natural Conditions	Mit	17	16.1		87-300	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 26.9 (PB)	.0 (PB) .0 (PB)
RM-22	Monitor Status of Threatened and Endangered Fauna	Mon	18	27.1		84-278	.0 (PB) .0 (RNR)	.0 (PB) .0 (RNR)	.0 (PB) .0 (RNR)	.0 (PB) 29.0 (RNR) 21.0 every five years	.0 (PB) .0 (RNR)
N-23	Complete Inventory of Aquatic Resources	Res	19	22.1		84-264	.0 (WR) .0 (WR)	.0 (WR) .0 (WR)	.0 (WR) .0 (WR)	.0 (WR) 40.0 (WR)	.0 (WR) 40.0 (WR)
N-31	Establish Long-Term Study Areas	Res	20	22.2		84-275	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 53.0 (RNR)	.0 (RNR) 53.0 (RNR)
RM-37	Long-Term Monitoring of Natural Communities	Mon	21				.0(PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 69.0 (PB)
N-25	Long-Term Evaluation of Effects of Acid Precipitation on Selected Ecosystems	Res	22	13.0		84-269	.0 (AP) .0 (AP)	.0 (AP) .0 (AP)	.0 (AP) .0 (AP)	98.8 (AP) 60.0 (AP)	98.8 (AP) 60.0 (AP)
N-33	Study Marmot Behavior	Res	23	12.3		85-282	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0(RNR) 15.0 (RNR)	.0 (RNR) 15.0 (RNR)

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Park: Sequoia and Kings Canyon National Parks

Natural Resources Projects Programming Sheet

Date: October 1987

Proj. No.	Project Title	Proj. Type 1/	RMP Pri	Park Pri	10-237 No.	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
RM-11	Exotic Beaver Control	Mit	32	29.1		87-301	.0 (CMNR) .0 (CMNR)	.0 (CMNR) .0 (CMNR)	.0 (CMNR) .0 (CMNR)	.0 (CMNR) .0 (CMNR)	.0 (CMNR) 5.0 (CMNR)
N-16	Succession in Mountain Meadows	Res	33				.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 30.0 (RNR)	.0 (RNR) 30.0 (RNR)
N-19	Assess Effects of Fire on Fauna	Res	34	25.1		84-276	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) .0 (RNR)	.0 (RNR) 25.0 (RNR)	.0 (RNR) 25.0 (RNR)
N-39	Museum Fauna Collections	Res	35				.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 10.0 (PB)
W-1	Study Impacts of Sewage on Mid-Sierran Streams	Mon	36			84-252	.0 (WR) .0 (WR)	.0 (WR) .0 (WR)	.0 (WR) .0 (WR)	.0 (WR) .0 (WR)	.0 (WR) 36.0 (WR)
RM-55	Bear Locker Maintenance	Mit	37	3.3		87-297	.0 (CMNR) .0 (CMNR)	.0 (CMNR) .0 (CMNR)	.0 (CMNR) .0 (CMNR)	.0 (CMNR) 18.5 (CMNR)	.0 (CMNR) 3.5 (CMNR)
RM-32	Deer Management and Monitoring	Mit/ Mon	38				.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 10.4 (PB)
RM-48	Monitor Impacts of Developed Sites	Mon	39				.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 80.0 (PB)
RM-47	Monitor Effects of Kaweah No. 3 Water Diversion	Mon	40				.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) .0 (PB)	.0 (PB) 25.0 (PB)

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Park: Sequoia and Kings Canyon National Parks

Natural Resources Projects
Programming Sheet

Date: October 1987

Proj. No.	Project Title	Proj. Type 1/	RMP Pri	Park Pri	10-237 No.	10-238 No.	Five Year Program Costs (in $1000) and Sources 2/ Yr 1 (87) Funded/New	Yr 2 (88) Funded/New	Yr 3 (89) Funded/New	Yr 4 (90) Funded/New	Yr 5 (91) Funded/New
N-4	Imolement Flood Plain Studies in Developed Sites	Res	41	33.1		84-265	.0 (WR) / .0 (WR)	.0 (WR) / .0 (WR)	.0 (WR) / .0 (WR)	.0 (WR) / .0 (WR)	.0 (WR) / 30.0 (WR)
RM-39	Vista Clearing	Mit	42	12.4		87-298	.0 (CM) / .0 (CM)	.0 (CM) / .0 (CM)	.0 (CM) / .0 (CM)	.0 (CM) / 24.6 (CM)	.0 (CM) / 8.0 (CM)
N-32	Sociological Studies of Park Visitors	Res	43				.0 (RNR) / .0 (RNR)	.0 (RNR) / .0 (RNR)	.0 (RNR) / .0 (RNR)	.0 (RNR) / .0 (RNR)	.0 (RNR) / 50.0 (RNR)
RM-13	Reestablish Natural Vegetation Mosaic in Campgrounds and Developed Areas	Mit	44		76-074		.0 (PB) / .0 (PB)	.0 (PB) / .0 (PB)	.0 (PB) / .0 (PB)	.0 (PB) / .0 (PB)	.0 (PB) / 87.9 (PB)
RM-50	Evaluate Environmental Effects Caused By Mineral King Dams	Res	45	32.1			.0 (RNR) / .0 (RNR)	.0 (RNR) / .0 (RNR)	.0 (RNR) / .0 (RNR)	.0 (RNR) / .0 (RNR)	.0 (RNR) / 30.0 (RNR)
RM-19	Dwarf Mistletoe Control	Mit	46		76-083		.0 (FS) / .0 (FS)	.0 (FS) / .0 (FS)	.0 (FS) / .0 (FS)	.0 (FS) / .0 (FS)	.0 (FS) / 52.9 (FS)
RM-16	Naturalize Cut Stumps and Logs	Mit	47	37.1	76-056	87-302	.0 (PB) / .0 (PB)	.0 (PB) / .0 (PB)	.0 (PB) / .0 (PB)	.0 (PB) / .0 (PB)	.0 (PB) / 5.0 (PB)

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LIST OF CONTINUING AND PROPOSED PROJECTS

Sequoia and Kings Canyon National Parks

The following is a list of continuing and proposed projects. Natural resources management projects are coded "RM", natural science projects are coded "N", and aquatic/water resources management project statements "W".

Reference Number	Project Title	Status of Project
RM-1	Resources management administration and supervision	Continuing
RM-3	Hazard tree removal	Continuing
RM-3a	Vegetation monitoring	Continuing
RM-7	Prescribed fire monitoring	Continuing
RM-8	Bear management	Continuing
RM-8a	Bear management (Ranger activities)	Continuing
RM-10	Hazard tree removal (Included as part of RM-42 on programming sheet)	Proposed FY89
RM-11	Exotic beaver control	Proposed FY91
RM-12	Mitigate impacts of man to vegetation	Proposed FY90
RM-13	Reestablish natural vegetation mosaic in campgrounds and developed areas	Proposed FY91
RM-16	Naturalize cut stumps and logs	Proposed FY91
RM-18	Preserve mountain meadows (Included as part of RM-12 on Programming Sheet)	Proposed FY90
RM-19	Dwarf mistletoe control	Proposed FY91

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

Reference Number	Project Title	Status of Project
RM-21	Monitor backcountry use impacts and rehabilitate backcountry sites	Proposed FY90
RM-22	Monitor status of threatened and endangered fauna	Proposed FY90
RM-23	Cave Management	Proposed FY91
RM-25	Restore abandoned trails and roads to natural conditions	Proposed FY90
RM-26	Wildland fire protection	Continuing
RM-27	Fish and wildlife management	Continuing
RM-27a	Creel census patrols (Ranger activities)	Continuing
RM-29	Air quality monitoring	Continuing
RM-30	Prescribed fire management	Continuing
RM-31a	Mitigation of bear/human interactions (Included as part of RM-42 on Programming Sheet)	Proposed FY89
RM-32	Deer management and monitoring	Proposed FY91
RM-33	Aquatic/fisheries management	Proposed FY90
RM-34	Support for water quality monitoring program (Included as part of RM-42 on Programming Sheet)	Proposed FY89
RM-36	Monitor status of reintroduced bighorn sheep	Proposed FY90
RM-37	Long term monitoring of natural communities	Proposed FY91

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

Reference Number	Project Title	Status of Project
RM-38	Monitor extent of ozone injury on vegetation	Continuing and Proposed FY89
RM-38a	Ozone monitoring	Continuing
RM-39	Vista clearing	Proposed FY91
RM-40	Water quality monitoring	Continuing
RM-41	Support for air quality monitoring program (Included as part of RM-42 on Programming Sheet)	Proposed FY89
RM-42	Bring natural resources management programs to minimum standards	Proposed FY89
RM-43	Monitor particulates and effects on vistas and health	Proposed FY90
RM-44	Develop facilities to support Biosphere Reserve natural resource programs	Proposed FY89
RM-45	WRO student COOP resources management trainee program	Continuing
RM-46	Exclude trespass cattle grazing and control road erosion in Biosphere Reserve	Proposed FY88
RM-47	Monitor effect of Kaweah No. 3 water diversion	Proposed FY91
RM-48	Monitor impacts of developed sites	Proposed FY91
RM-49	Plant nursery operations	Proposed FY89
RM-50	Evaluate environmental effects caused by Mineral King dams	Proposed FY91

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

Reference Number	Project Title	Status of Project
RM-51	Normal year fire programming (FIREPRO)	Continuing
RM-52	Dwarf mistletoe control	Continuing
RM-53	Clover Creek/Red Fir revegetation/landscaping	Continuing
RM-54	Bear canister development	Continuing
RM-55	Bear locker maintenance	Proposed FY90
RM-56	Wilderness management (Ranger activities)	Continuing
RM-56a	Meadow monitoring (Ranger activities)	Continuing
RM-57	Backcountry trail restoration (Maintenance)	Continuing
RM-58	Cyclic backcountry trail restoration	Continuing
RM-59	CCC backcountry trail restoration	Continuing

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

Reference Number	Project Title	Status of Project
N-1	Base for research (Parsons)	Continuing
N-1a	Base for research (Graber)	Continuing
N-13	Ecological studies of rare and extirpated species	Proposed FY89
N-15	Fire history/ecology of giant sequoia ecosystems	Proposed FY87
N-15a	Fire history/ecology of giant sequoia ecosystems	Continuing
N-16	Succession in mountain meadows	Proposed FY90
N-19	Assess effects of fire on fauna	Proposed FY90
N-21	Development of ecological data-base to evaluate impacts of management problems and external influences on Park ecosystems	Continuing
N-22	Reintroduce bighorn sheep	Proposed FY89
N-23	Complete inventory of aquatic resources	Proposed FY90
N-25	Long term evaluation of effects of acid precipitation on selected ecosystems	Proposed FY90
N-26	Ecology and mitigation of exotic plants	Proposed FY90
N-27	Effects of acid rain on vegetation and aquatic ecosystems	Continuing
N-28	Support for long term research	Proposed FY89
N-29	Acquire natural resource information system	Proposed FY88

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

Reference Number	Project Title	Status of Project
N-30	Assess air pollution threats to sensitive ecosystems	Proposed FY89
N-31	Establish long term study areas	Proposed FY90
N-32	Sociological studies of Park visitors	Proposed FY91
N-33	Study marmot behavior	Proposed FY90
N-34	Investigate cowbird invasion in SEKI	Proposed FY89
N-35	Soil survey of Sequoia and Kings Canyon National Parks	Proposed FY90
N-36	Black-tailed hare reintroduction study	Proposed FY90
N-37	Population dynamics of subalpine forests	Proposed FY89
N-38	Fire ecology of transition forests	Proposed FY89
N-39	Museum fauna collections	Proposed FY91

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

Reference Number	Project Title	Status of Project
W-1	Study impacts of sewage mid-Sierran streams	Proposed FY91
W-4	Implement floodplain studies in developed areas	Proposed FY91
W-6	Measure impact of people on backcountry lakes	Proposed FY89

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-10-HAZARD TREE REMOVAL:
(Included as Part of RM-42)

2. STATEMENT OF PROBLEM

A. Current Condition:

From 1970 through 1986, 451 trees failed in developed areas, causing an estimated $314,000 in property damage. There were also six personal injuries associated with these failures. In 1982 alone there were 76 tree failures that caused an estimated $205,000 in property damage. The major defect in these failures was rot, with snow and wind being the primary contributing factors. Three of the trees failing in 1982 were identified hazard trees that caused $97,000 in property damage.

These Parks have had a formal hazard tree removal program since 1970. Initially 6,000 hazard trees were identified in developed areas and along primary roadways. From 1970 through 1986, these Parks' Forestry Crew has removed approximately 5,400 hazard trees. Additional hazard trees have been removed by timber contractors. Despite these removals an average of 28 trees fail each year, causing property damage.

Most of the developed areas are located in mature or over-mature forests. Many of the trees in these forests have defects rendering them unsafe. These defects, which normally accompany decadence and death in trees, form a part of the natural renewal process in the forest. Under natural conditions, they are beneficial. However, there is cause for concern when people congregate under defective trees in campgrounds or other developments. These parks have both a legal and moral obligation to provide a certain level of visitor and employee safety. Liability for insuring visitor safety in developed areas has been established by the Solicitor General on the basis that the public is invited to developments. The National Park Service is obligated to provide for public safety.

Hazard is defined as "the probability of mechanical failure or uprooting of a tree with consequent injury or property loss" (Paine, 1973). Trees can not be classi-

fied as either hazardous or non-hazardous since nearly all trees have a recognizable probability of failure and involvement in an accident (Paine, 1971). A 100 percent level of safety would entail removing most of the trees from a site. Besides being costly, it would reduce the aesthetic value and usefulness of the site. Therefore, some trees with recognizable hazard must be retained. Safety becomes a compromise between control cost, aesthetic value, and probability of accident losses.

Factors affecting accident hazards are: (1) the probability of tree failure; (2) the probability of target impact; (3) the damage potential and (4) the target value (Paine, 1971). The probability of failure, which is affected by defects of the tree as well as by environmental and site factors, includes only potential failures during the season of use. Contributing factors (such as snow load, wind, etc.) which occur other than during the season of use are not considered when assigning a priority hazard rating.

The probability of target impact is determined by both the chance of a failure striking a specific area and the likelihood of that area being occupied. Probability of an accident then, is the product of the probabilities of failure and impact. Accident loss is determined by the ability of the failure class to inflict damage and target value.

To provide an acceptable level of hazard reduction, Paine (1971, 1973) suggests the following steps be followed: (1) select a goal; (2) set a safety standard based on the defined goal; (3) provide a uniform method for rating hazard; (4) set a hazard rating (hazard control level) below which hazard will not be controlled; (5) perform regular and systematic technical examination of the sites for recognition and evaluation of hazard; and (6) perform appropriate hazard reduction. Paine suggests that the goal of hazard evaluation and control is to "provide an acceptable level of public safety at minimum cost and with the least damage to the environment" (Paine, 1971). This acceptable level of public safety is determined by the minimum attainable and current accident rates. It involves the use of cost optimization (Paine, 1973).

B. Past Management Actions:

Prior to 1970, removal of hazard trees was a function of the Ranger, Maintenance, and Resources Management Divisions at various times.

Trees identified as hazards were removed during the 1960's by the Maintenance Division. Potential hazards along roads, backcountry and high-use front country tails, and in developed areas were detected, inventoried and removed with assistance from the Park Forester. The concessionaire was responsible for hazard tree removal on lands it leased within these Parks. In 1968, Director George Hartzog placed this responsibility under the National Park Service.

Other alternatives used have been the now defunct Western Tree Crew, loan of personnel from other parks, contracts with local loggers and concessioner-contracted wood cutters. While there have been attempts to sell hazard trees, it is not economically feasible in many cases because of the high percentage of cull and limited, scattered volumes. However, there have been exceptions. In 1967, 1,405 roadside trees between Grant Grove and Lost Grove were sold in a cooperative timber sale with the Forest Service.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Discontinue all hazard tree and limb removal from these Parks' developed areas.

Adverse impacts would be an increase in personal injury, property damage, and possible death from falling trees and limbs.

Beneficial impacts would be the elimination of noise and disturbance to the site. Trees and limbs would be allowed to remain, providing additional habitat for animals.

B. Continue the Hazard Tree Removal Program at the Current (Minimum Level):

Every three years all developed areas would be surveyed and evaluated for hazard trees. Trees around structures

that are occupied year round would be surveyed annually.

Currently approximately 300-400 high hazard trees are removed each year from these Parks' developed areas. All stumps are flush cut and treated with borax to prevent inoculation by Fomes annosus. Limbs are lopped and scattered, chipped, cut up and left for firewood, or hauled and burned. Boles are bucked and removed, to be sold as timber or firewood.

Adverse impacts include disturbance to the site, noise, and loss of habitat. Conducting removal operations when visitation is low or closing areas would help mitigate the disturbance to the visitor.

Beneficial effects are increased protection for people and property.

C. Increase the Hazard Tree Removal Program to the Basic Operating Level:

Under this alternative, funding would be increased to provide a greater degree of protection from hazard trees. All high priority hazard trees (6 and 7) would be removed from each developed area every three years. Medium priority hazard trees (5) as well as high priority hazard trees would be removed annually from around structures occupied year round. All sites would be completely cleaned up and restored to "natural" conditions. Some 400-500 trees would be removed each year.

Adverse and beneficial effects would be greater than alternative B.

D. Contract Hazard Tree Removal:

Hazard trees would be identified and sold to the highest bidder. The contractor would fell the trees, clean up and naturalize the site, and remove all trees from these Parks. Our only involvement would be to identify the hazard trees, determine their volume and monitor the felling and removal operation.

This would be the least expensive method of removing hazard trees. Problems that could occur include damage to the site by the contractor, traffic problems caused by logging trucks, and possible adverse reaction from the

visitor. Also, timber sales would only be possible if there were sufficient merchantable volume to make it profitable to contract a logger.

4. RECOMMENDED COURSE OF ACTION:

Alternative C is the preferred alternative. This alternative would provide a level of control to ensure that people and structures are adequately protected from hazardous trees and limbs.

A. Resources Management Actions:
(See the Vegetation Management Plan for details)

(1) Hazard Tree Removal:

Approximately 400-500 moderate to high hazard trees would be removed annually from these Parks' developed areas.

(2) Disposal of Logs, Limbs and Slash:

The Forestry Crew would fell and buck trees into transportable lengths which would be removed to the nearest woodyard. Slash would be chipped, lopped, and scattered for use by campers, or hauled and burned.

When the volume of wood from hazard tree removal exceeds the Parks' requirements, the logs would be sold as surplus property to the highest bidder or as firewood by permit. GSA would administer the contract.

(3) Stump Treatment:

All stumps would be treated with borax to prevent inoculation by Fomes Annosus.

(4) Length of Time Needed:

All actions are recurring and would be carried out indefinitely.

B. Monitoring Actions:

All trees would be surveyed and evaluated annually in

developed areas where structures are occupied on a year round basis. All other areas would be surveyed every three years.

Procedures for conducting the surveys are identified in the Vegetation Management Plan.

C. Interpretive Actions:

In the developed areas where the Forestry Crew would be working, the interpretive staff would inform park visitors at evening programs. This interpretation would include the reasons the trees must be removed, what the wood is being used for, and a safety message cautioning visitors to stay clear of the immediate area. A short story would be prepared by the Resource Management staff for inclusion in the Sequoia Bark relating the above message.

5. FUNDING:

A. Recurrent funds Available in Parks' Base - $96,700.

B. O.N.P.S. Funds Requested - $52,400 (Included in Inc. No. 161 on Natural Resources Project Programming Sheet).

C. Funding Source Requested - Park Base.

6. REFERENCES:

Paine, Lee A. 1971. Accident hazard evaluation and control decisions on forested recreation sites. U.S.D.A. Forest Service Res. Paper PSW-68, 10p. illus. Pacific Southwest Forest and Range Exp. Stn., Berkeley, California.

Paine, Lee A. 1973. Administrative goals and safety standards for hazard control on forested recreation sites. U.S.D.A. Forest Service Res. Paper PSW-88, 13p. illus. Pacific Southwest Forest and Range Exp. Stn., Berkeley, California.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-11-EXOTIC BEAVER CONTROL:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

In the Kern Canyon, exotic beaver are altering the natural environment by constructing dams, restricting natural flows, and feeding on and falling trees resulting in altered vegetation and aquatic environments. Changes in the stream could affect both fish and invertebrate populations.

Previous use by beaver is evident along much of the Kern River, and fresh workings were found when last examined in 1984. The current status of the population is unknown since there is no monitoring program.

(1) Goal:

Extirpate the population of exotic beaver from the Kern drainage.

(2) Objectives:

a. To control and attempt extirpation of beaver from the Kern drainage of Sequoia National Park.

b. To destroy dams and other beaver construction.

c. To rehabilitate, where practical, areas altered by beaver.

d. To monitor the size and impact of the beaver population.

e. To encourage an interagency effort to eliminate beaver from the Kern drainage.

B. Past Actions:

A reduction program was executed by U.S. Fish and Wildlife Service personnel in 1969 and 1970. Surveys of the area in the 1970's revealed that the beaver population now approximates the pre-1969 level. There have not been any recent thorough surveys.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Exotic beaver may continue to occupy the bottom of the Kern Canyon altering both the streams and riparian vegetation. Whether the population will remain near its current level, shrink due to a loss of food, or expand into new habitat is unknown.

B. Monitor the Beaver Population:

The environmental effects would be the same as above, but we would learn the true seriousness or lack of urgency to controlling the beaver population. This would not help the natural environment, we would only know more about how it is being changed.

C. Control and Monitor the Beaver Population:

The beaver will either be extirpated or kept at low numbers. Beaver structures will be obliterated as they are discovered, and altered areas will be obliterated.

4. RECOMMENDED COURSE OF ACTION:

Alternative C which includes:

A. Management Actions:

Additional temporary Park Technicians would provide necessary labor to control beaver and their dams in the Kern Canyon. Since it is difficult, if not impossible, to remove all of the beaver in the Park, reduction will be aimed at removing as many beaver as possible. The population will be surveyed on a three year cycle. Any individuals remaining will be removed. The Parks will encourage the expansion of the project to an interagency cooperative project that would include Sequoia National Forest, increasing the potential for complete extirpation.

B. Monitoring Actions:

Efficient application of remedial measures requires monitoring and surveying to determine the effects of beaver tree cutting, water impoundment, vegetation and stream ecology impacts.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $21,000.

C. Funds Source Requested - Cyclic Maintenance Natural Resources.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-12-MITIGATE IMPACTS OF MAN TO VEGETATION:

2. STATEMENT OF THE PROBLEM:

A. Front country:

There are approximately 1,000 acres in the developed areas within these Parks (exclusive of roadsides). The objective for managing vegetation in these areas is to re-establish and maintain a healthy forest community that approximates "natural" conditions, given the constraints of present and past human intervention. Vegetation ranges from chaparral, ponderosa pine forest, sequoia mixed-conifer forest, to red fir forest. The vegetation in these developed areas has been severely altered since these Parks were established. Fire exclusion, for example, has resulted in an increase of over-mature trees that are a safety hazard, an over-abundance of shade tolerant trees, such as white fir, that compete for moisture with overstory trees, and an increased level of insect related mortality and disease.

Management actions, such as paving over roots, removal of trees without treating stumps with borax to inhibit the spread of Fomes annosus, and mechanical damage associated with construction have resulted in increased tree mortality, altered forest structure and composition. Heavy visitor use has caused soil compaction, denuding of some areas, erosion, and inhibited natural regeneration.

The chaparral/oak woodland community was changed by early grazing and fire exclusion. Native perennial bunch grasses and herbs have been largely replaced by non-native annual grasses and herbs. Fire suppression has resulted in tens of thousands of acres of uniformly aged flammable brush, presenting a significant safety hazard.

In addition to the above internal impacts, there are external impacts that can permanently alter the vegetation in the Development Zone as well as throughout these Parks. The chlorotic mottling on needles caused by the air pollutant, ozone, has already been identified on Jeffrey and ponderosa pines (Wallner and Fong, 1982). Acid precipitation, with a minimum ph of 3.5 has been recorded near Giant Forest (Duriscoe and Nichols, 1982). The impacts of these pollutants could be irreversible.

B. Backcountry:

Mountain meadows are subject to a variety of visitor use activities including hiking, camping and grazing by pack and saddle stock. These uses may cause or accelerate erosion and change vegetative composition and productivity. Such use may also affect successional trends and rates, alter drainage patterns, and initiate changes in subsurface moisture relations.

Many miles of trail are located in meadow vegetation. Trail treads in meadows are potential precursors of serious gullying and erosion that could threaten the stability of the meadow itself. A parkwide inventory of active and abandoned trails in meadow vegetation should be completed and is necessary to prioritize remedial action. All abandoned trails need to be obliterated and original drainage patterns restored. In most cases, active trails need to be relocated and the abandoned trail rehabilitated. Where active trails cannot be reasonably and effectively relocated, existing treads must be redesigned to allow for drainage that does not endanger the integrity of the meadow ecosystem. Techniques for trail rehabilitation have not been systematically evaluated as to their success and cost effectiveness. A program to document, monitor and evaluate the rehabilitative techniques should be undertaken to insure maximum efficiency and effectiveness.

Sequoia and Kings Canyon National Parks will institute a new Stock Use and Meadow Management Plan in 1986 aimed at reducing the impact of pack and saddle stock. A monitoring program evaluating the success of the plan and fine tuning its site specific prescriptions is management's responsibility.

C. Program Direction:

Vegetation management is a diverse program of mitigating impacts to vegetation throughout these Parks. Program planning, development, coordination, implementation, and monitoring cannot be accomplished by current staff. Professional direction and management by a Backcountry and Vegetation Management Specialist assisted by a staff of professionals and technicians with adequate support costs is essential for a fully coordinated and planned program.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Under this alternative the vegetation in developed areas would not be "managed to re-establish and maintain a healthy forest community that approximates 'natural' conditions, given the constraints of present and past human intervention."

The only management action would be to remove hazard trees. Also, no action would be undertaken to restore fragile meadows or to monitor stock use impacts to meadows.

Impacts of the no action alternative include:

(1) Insect and disease problems would increase in developed areas. Areas would eventually become denuded because of continued removal of hazard trees.

(2) The aesthetics of the developed areas would be objectionable to the visitor.

(3) Erosion in meadows would accelerate subsequently changing species structure, density, and composition.

(4) Stock use impacts to meadows would increase because of no monitoring.

(5) The effectiveness of the Stock Use and Meadow Management Plan would remain unknown or only qualitatively accessible.

B. Continue the Vegetation Management Program at the Current Level:

The current vegetation management program in the front country consists of hazard tree removal, insect and disease management, and revegetation. There is currently no action being taken to restore or monitor mountain meadows.

Lack of a completely integrated vegetation management program in the front country means that primarily the symptom (hazard trees) of the problem is addressed, rather than managing to prevent hazard trees.

Impacts to vegetation would increase. Backcountry meadows would continue to erode unacceptably and stock use impacts to meadows could not be assessed.

C. Implement an Integrated Vegetation Management Program for the Front Country and Backcountry:

Under this alternative a Vegetation Management Plan for front country developed sites and the Stock Use and Meadow Management Plan for the backcountry would be implemented. The Plans outline the objectives, policies, and actions for a professional vegetation management program.

Permanent condition and trend plots would be established in selected meadows. Site specific use level and opening date prescriptions would be reviewed empirically in the field and modifications recommended when appropriate.

The potential for resource damage would be evaluated and prioritized for rehabilitating all trails (abandoned and active) in meadow vegetation. An estimation of the labor and support necessary to accomplish each job would also be done. Supervisory personnel would be hired to direct special initiative program labor.

Research and monitoring necessary would be initiated to evaluate and determine the cost effectiveness of different rehabilitative techniques. Without this effort, the transfer of knowledge and the efficiency of the program will be impaired.

Benefits from this alternative include the following:

(1) Human impacts to vegetation in the front country developed areas and backcountry would be mitigated.

(2) A healthy, safe, aesthetically pleasing environment would develop in the front country developed areas.

(3) Human-caused erosion in mountain meadows would be reduced.

(4) Natural processes would be able to shape the environment in backcountry meadows after restoration is complete.

4. RECOMMENDED COURSE OF ACTION:

Vegetation Management and Stock Use and Meadow Management Plans to implement an integrated vegetation management program have been developed. The Plans will be ready for implementation in 1986. Under this program the following would be accomplished:

A. Native plant species composition would be reestablished and maintained.

B. Forest insects and diseases would be managed.

C. Denuded and eroded areas would be revegetated.

D. A monitoring program would be developed to assess the effectiveness of the programs.

E. Permanent condition and trend plots would be established to evaluate the effectiveness of the Stock Use and Meadow Management Plan. The entire meadow tract system would be evaluated and rehabilitated. Research and monitoring would be implemented evaluating the effectiveness of rehabilitation techniques and of recovery time in different edapho-vegetation types.

F. An interpretive program would be developed to educate the visitor on minimum impact camping in the backcountry. The following would be accomplished:

(1) The interpretive staff would present backpacking demonstrations in each area which will stress minimum impact backpacking.

(2) Trailhead wilderness permit issuers would be trained to stress and promote minimum impact backpacking when they issue each and every permit. Folders that have been received or prepared stressing minimum impact use would be available for backpackers.

(3) At least one evening program would be prepared and presented weekly in each area dealing with the backcountry and its special features and man's responsibility to keep it that way.

These programs would provide a more "natural," aesthetically pleasing, and safe environment in these Parks' developed areas and backcountry.

A professional Backcountry and Vegetation Management Specialist and additional technicians would be hired to provide an adequate staff to implement the vegetation management program.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - $53,400.

B. O.N.P.S. Funds Requested - $167,000.

C. Funding Source Requested - Park Base.

6. REFERENCES:

Duriscoe, Dan, and Tom Nichols. 1982. Air quality management; a progress report, Sequoia and Kings Canyon National Parks, December 1982. Unpubl. National Park Service Report. 10p.

Wallner, Douglas W., and Mitchell Fong. 1982. An analysis of ozone injury to ponderosa and Jeffrey pines in Sequoia and Kings Canyon National Parks, Final Survey Results 1980-1982. Unpubl. National Park Service Report, 15p.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-13-REESTABLISH NATURAL VEGETATION MOSAIC IN CAMPGROUNDS AND DEVELOPED AREAS:

2. STATEMENT OF THE PROBLEM:

Modifying human influences, such as fire suppression, hazard tree removal, trampling, soil compaction, reduction or removal of natural ground cover, and mechanical abuses, have combined to upset and retard natural regenerative processes and disrupt the natural scene within the campgrounds and developed areas. These areas need to be restored to more natural conditions.

3. ALTERNATIVES AND THEIR PROBABLE IMPACTS:

A. No Action:

Under this alternative the "natural" vegetation mosaic would not be reestablished. No vegetation management including hazard tree removal would be done. This would result in continued lack of regeneration. The forest would become increasingly sparse with the resulting vegetation mosaic becoming even more unnatural. Dead, dying, and defective trees would remain, posing serious safety hazards.

B. Continue the Present Vegetation Management Program in Campgrounds and Developed Areas:

Hazard trees would continue to be removed. No attempt would be made to reestablish the "natural" vegetation mosaic. Impact would be the same as Alternative A except that the vegetation mosaic would more quickly become unnatural because of hazard tree removal.

C. Reestablish the "Natural" Vegetation Mosaic in Campgrounds and Developed Areas:

The "natural" vegetation mosaic would be determined and restored by using silvacultural techniques, such as thinning, and planting of native species. Vegetation used to recreate the "Natural" vegetative mosaic would be transplanted from nearby disturbed areas or grown in the Parks' nursery. Approximately 865 acres of campground and developed areas exclusive of roadside are involved.

4. RECOMMENDED COURSE OF ACTION:

Alternative C is the preferred alternative. The following would be accomplished:

A. Forest stands in developed areas would be managed at stocking levels which are less than the "normal" or fully stocked condition. This would result in good tree vigor and increased resistance to insects and disease.

B. Thinning requirement would be based on U.S. Forest Service biological evaluations and site specific studies to determine growth rates versus stand density relationships.

C. Certain "high risk" trees, those having limited life expectancy, would be removed prior to construction of new park developments, such as Clover Creek and Grant Grove.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $87,900.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-16-NATURALIZE CUT STUMPS AND LOGS:

2. STATEMENT OF PROBLEM:

Past tree removal activities by both Park and contract personnel have produced an estimated 2,000 cut stumps and log faces throughout these Parks within and surrounding developed areas and road prisms. These cuts are tangible incursions on the natural scene which these Parks attempt to preserve.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACT:

A. No Actions:

Cut stumps and logs would not be removed. They would remain an unacceptable intrusion on the natural scene.

B. Remove Cut Stumps and Logs Along Roads and in Developed Areas:

All cut stumps and logs along roads and in developed areas would be blasted by contracted personnel. The scenic environment in the high use visitor areas would be improved. Blasting would disturb the visitor's experience and could be a safety problem if not properly accomplished.

C. Remove Cut Stumps and Logs Only in Developed Areas:

Same as Alternative B. Costs would be less.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is the preferred alternative. One third (660) of the cut stumps and logs would be removed by contract on a three year cycle. This would be done primarily by blasting.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $5,000 every three years for nine years.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-18-PRESERVE MOUNTAIN MEADOWS:
(Included as part of RM-12)

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Mountain meadows are subject to a variety of visitor use activities including hiking, camping and grazing by pack and saddle stock. These uses may cause or accelerate erosion and change vegetative composition and productivity. Such use may also affect successional trends and rates, alter drainage patterns, and initiate changes in subsurface moisture relations.

Many miles of trail are located in meadow vegetation. Trail treads in meadows are potential precursors of serious gullying and erosion that could threaten the stability of the meadow itself. A parkwide inventory of active and abandoned trails in meadow vegetation should be completed and is necessary to prioritize remedial action. All abandoned trails need to be obliterated and original drainage patterns restored. In most cases, active trails need to be relocated and the abandoned trail rehabilitated. Where active trail cannot be reasonably and effectively relocated, existing treads must be redesigned to allow for drainage that does not endanger the integrity of the meadow ecosystem. Techniques for trail rehabilitation have not been systematically evaluated as to their success and cost effectiveness. A program to document, monitor and evaluate the rehabilitative techniques should be undertaken to insure maximum efficiency and effectiveness.

Sequoia and Kings Canyon National Parks will institute a new Stock Use and Meadow Management Plan in 1985 aimed at reducing the impact of pack and saddle stock. A systematic monitoring program evaluating the success of the plan and fine tuning its site specific prescriptions is management's responsibility.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Rehabilitation of abandoned treads would occur as volun-

teer and special initiative work programs make labor and supervisory personnel available from other responsibilities. Work sites may not be of highest priority. Rerouting or redesign of active trails in meadows will be delayed. The effectiveness of the Plan will remain unknown or only qualitatively accessible.

B. Institute a Program to Monitor the Effectiveness of the Stock Use and Meadow Management Plan:

Permanent condition and trend plots would be established in each of six to eight plant associations and along a use gradient. Site specific use level and opening date prescriptions would be reviewed empirically in the field and modifications recommended when appropriate.

C. Evaluate Resource Damage:

The potential for resource damage would be evaluated and prioritized for rehabilitating all trails (abandoned and active) in meadow vegetation. An estimation of the labor and support necessary to accomplish each job would also be done. Supervisory personnel would be hired to direct special initiative program labor.

D. Develop a Research and Monitoring Program:

Research and monitoring necessary would be initiated to evaluate and determine the cost effectiveness of different rehabilitative techniques. Without this effort, the transfer of knowledge and the efficiency of the program will be impaired.

4. RECOMMENDED ACTIONS:

The recommended action is a combination of B, C, and D. Permanent condition and trend plots would be established to evaluate the effectiveness of the Stock Use and Meadow Management Plan. The entire meadow tract system would be evaluated and rehabilitated. Research and monitoring would be implemented evaluating the effectiveness of rehabilitation techniques and of recovery time in different edapho-vegetation types.

5. FUNDING

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $ 43,900.
(Included as part of Inc. No. 140 on Natural Resources Projects Programming Sheet.)

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-19-DWARF MISTLETOE CONTROL:

2. STATEMENT OF PROBLEM:

Dwarf mistletoes are parasitic plants which weaken, deform, and kill coniferous trees. Their incidence and intensity have reached epidemic levels in the Cedar Grove developed area. According to Pronos (1981) "If dwarf mistletoe is not controlled it will continue to intensify, spread to healthy trees and deteriorate trees already infected, making them more susceptible to insect attack. The eventual outcome will be large openings without conifers. Severely infected trees usually die within 10-15 years unless environmental stresses such as drought or over-stocking accelerate this mortality."

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

No control actions to reduce the level of dwarf mistletoe at Cedar Grove would be undertaken. This would result in an unnecessary loss of trees. Campgrounds and all other developed areas would be gradually denuded of conifers and reintroduction would be eliminated as sound trees are infected.

Visitors would be subjected to increasing levels of hazard from limb and tree failures. Preservation of a mixed conifer forest stand in the Cedar Grove area would not be achieved.

B. Reduce Dwarf Mistletoe Impact at Cedar Grove:

Selective pruning, thinning, and removing would be done annually to control, and then prevent, the spread of the disease. Such pruning would also remove limb hazards, caused by the parasitic growths, which threaten public safety in the area. With a control program dwarf mistletoe would be reduced and a healthier forest assured.

4. RECOMMENDED COURSE OF ACTION:

A dwarf mistletoe control program, as recommended by Pronos (1981), would be implemented. This would include the following:

A. Removing severely infected trees.

B. Removing lighter infection by pruning.

C. Creating buffer strips.

D. Favoring resistant species (includes planting).

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - None.

C. U.S. Forest Service Forest Pest Funds Requested - $105,870.

6. REFERENCES:

Pronos, John. 1981. An evaluation of dwarf mistletoe in Cedar Grove Campgrounds, Report No. 81-11, Forest Pest Management USDA Forest Service, Pacific Southwest Region, San Francisco, California. 4p.

Pronos, John, and Schultz, David. 1983. An evaluation of tree mortality in four Cedar Grove Campgrounds, Kings Canyon National Park, Report No. 83-09, Forest Pest Management USDA Forest Service, Pacific Southwest Region, San Francisco, California. 22p.

Warner, Thomas. 1983. Dwarf mistletoe control, Sheep Creek Campground, Cedar Grove, Kings Canyon National Park, Forest Insect and Disease Management Project Proposal, Sequoia and Kings Canyon National Parks. 14p.

Warner, Thomas, and Douglas Wallner. 1984. Dwarf mistletoe control, Sentinel Campground, Cedar Grove, Kings Canyon National Park, Forest Insect and Disease Management Project Proposal, Sequoia and Kings Canyon National Parks. 15p.

Warner, Thomas, and Sylvia Haultain. 1985. Dwarf mistletoe Control, Sentinel, Canyon View, and Moraine Campgrounds, Cedar Grove, Kings Canyon National Park, Forest Insect and Disease Management Project Proposal, Sequoia and Kings Canyon National Parks. 18p.

Warner, Thomas. 1986. Dwarf mistletoe control, Canyon View and Moraine Campgrounds, market, NPS/concession housing areas, Cedar Grove, Kings Canyon National Park, Forest Insect and Disease Management Project Proposal, Sequoia and Kings Canyon National Parks.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-21-MONITOR BACKCOUNTRY USE IMPACTS AND REHABILITATE BACKCOUNTRY SITES:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Heavy visitor use in Sequoia and Kings Canyon National Parks has resulted in serious resource damage throughout the backcountry. These impacts include the denudation and/or alteration of vegetation in campsites and along trails, the development of multiple trails, increased rates of erosion, compacted soils, degraded water quality, disrupted wildlife habitat, and reduced opportunities for solitude. Budget cutbacks have severely cut into the size of the crews doing backcountry work. It is NPS policy and responsibility to preserve natural values by mitigating unnatural impact. The monitoring of backcountry use levels and impacts is the first step in achieving these ends.

A trailhead quota system and supplemental restrictions, including party size and site specific length of stay limits, and restrictions on the use of woodfires have been imposed to reduce the potential for impact. Baseline data on affected sites and impact trends are unavailable for most areas. Consequently, the ability of the quota system to reduce direct environmental impact and promote full recovery of heavily impacted areas has not been quantitatively assessed.

Qualitative observation by Park staff indicate that major problems still remain. Site sensitivity and type of use are probably more important in predicating impact than are use levels. Dispersion of use by the quota system, site closures, or one night limits may cause additional resource degradation without reducing impacts in heavily used areas. This is true because much damage occurs from relatively light use and recovery occurs very slowly and only when use levels approach zero.

Increased knowledge of impacts and impact trends is required to assess current management effectiveness and when necessary, facilitate the development of supplemental and/or alternate strategies that will achieve management objectives.

Some 74 percent of the regularly used backcountry campsites are located within 100 feet of water. All campsites within 25 feet of water must be obliterated and the site rehabilitated to prevent subsequent use. Many sites between 25 and 100 feet from water should also be eliminated. In some cases, appropriate campsite locations must be identified and/or the campsites themselves constructed. Currently, backcountry rangers are only able to scratch the surface of this task. Additionally, fire rings and their evidence exist in many areas closed to wood fires. Their presence continues to invite the illegal use of fire and consumption of wood, blackens rock surfaces, and are unnecessary detractants from the natural scene. A tremendous backlog of sites need remedial actions. An estimated 5,000 sites need to be rehabilitated, every three years.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

The present management program would continue without quantitative assessment of its effectiveness. Problems not directly addressed by the quota system or current supplementary management directives will continue to grow. Since research and observations indicate that current strategy is ineffective in accomplishing management goals, detrimental impacts will continue to accumulate. As resource impacts accumulate and compound, the cost and difficulty of eventual restorative action will increase.

B. Implement a Backcountry Impact Monitoring and Rehabilitation Program:

A monitoring system would utilize and improve upon the existing baseline for measuring change and evaluating the effectiveness of current management strategies. Approximately every 5 years a major thrust would be given to recording use data by travel zone (from wilderness permits) to evaluate possible shifts in visitor use. Quantitative information would be gathered on such use impacts as the number and area of campsites, the amount of denuded area within sites, the amount of campsite development, sanitation problems, trampling, and vegetation alteration. Trails would be monitored for factors such as width, depth, and number of treads, erosion, drainage problems, and trailside vegetation changes. The proliferation of

unmaintained trails due to cross-country travel would be documented. Site specific use information would be collected in selected areas to relate observable change to environmental characteristics and associated use levels and types. The information derived from the backcountry impact monitoring program would be the basis for the derivation of supplementary and/or alternative management strategies that would more closely achieve management objectives.

The monitoring data should be collected and analyzed in a way to maximize abilities to predict the impact-sensitivity of different communities such that the type, magnitude, and rate of change can be related to environmental characteristics and the timing, intensity, frequency, and type of use. Additionally, the entire backcountry must be ecologically surveyed to develop site-specific corrective strategies where appropriate and ensure that further impacts are prevented.

Major effort will be given to developing the Limits of Acceptable Change program for the Sequoia and Kings Canyon backcountry.

Increased protection of water resources, sensitive streamside and shoreline habitat, and susceptible vegetation would result from elimination and rehabilitation of campsites too close to water. Rehabilitation and obliteration of abandoned and rerouted trails and fire rings would reduce the risk of locally acute damage to these areas that can occur with heavy rain and runoff events. Insidious erosion would be halted. An estimated 5,000 sites need to be rehabilited on a three year cycle.

4. RECOMMENDED ACTIONS:

The recommended alternative is B. Completion of the baseline inventory and ecological survey will assure that research findings are applied. The monitoring and management programs will minimize unacceptable impacts to the sensitive backcountry resources.

The no action alternative is unacceptable because information critical to the evaluation of the present management program will remain unavailable. Inadequacies of the present system will be perpetuated and resource degradation will increase and be compounded. The cost of remedial action will continue to escalate with delay.

The interpretive staff in each area will present backpacking demonstrations at least twice weekly stressing minimum impact use of the backcountry. At least one evening program will be prepared and presented weekly in each area that will stress, among other things, the impacts of man on the wilderness and the importance of minimum impact backpacking.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested: $25,000 for the monitoring program and $15,000 every three years for site rehabilitation.

C. Funding Sources Requested - Park Base and Cyclic Maintenance.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-22-MONITOR STATUS OF THREATENED AND ENDANGERED FAUNA:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Of these Parks' fauna, the Little Kern golden trout is listed as threatened, and the peregrine falcon, California condor, and bald eagle as endangered. The entire distribution of pure Little Kern golden trout is not known and known populations need to be monitored. Since specimens from pure populations are being used for restoring them to their original distribution, it is particularly important to monitor impacts to the pure fish and the success of transplanted individuals. Formerly, at least one peregrine eyrie was known in Sequoia National Park. Condors have been extirpated in the vicinity of these Parks. Condors frequent areas near Sequoia National Park. Peregrine falcons are seen intermittently; however, their status within these Parks is unknown. Bald eagles are observed rarely.

(1) Goal:

To provide for the identification, protection, proliferation, and eventual delisting of all threatened and endangered species.

(2) Objectives:

a. To determine the historic and current distribution and abundance of all listed species.

b. To evaluate the potential habitat present in these Parks with regard to each threatened and endangered species.

c. To take action to restore extirpated species to areas from which they may have been extirpated due to historic use of an area.

B. Past Actions:

The Little Kern golden trout in Soda Springs Creek has been surveyed several times with wide discrepancies in

population estimates. The Coyote Creek population has never been surveyed other than a general empirical reconnaissance of the area. Critical habitat has been identified for the Soda Springs population. Other trout and hybrids have been removed from the Soda Springs Creek drainage (NPS), and pure specimens have been moved downstream to restock the waters. Efforts to improve fecundity of the Soda Springs Creek stock using artificial propagation in hatcheries have been unsuccessful; richer fecundity is needed to facilitate the supply of fish available for the remainder of the restoration program.

In 1980, 20 person-days were set aside to initiate surveying the status of the endangered birds. None were found though these species are still occasionally reported in or near these Parks. Formerly peregrine falcons were much more widespread in the Sierra Nevada, and an historic eyrie was reported within these Parks.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

The status of these species and management practices (such as trail locations) will remain unknown. These Parks will not have adequate information for Section 7 consultations. Without this information these Parks could unknowingly engage in management practices that violate the Endangered Species Act (amended) and undertake actions (e.g., certain types of fire suppression at wrong locations; new trail locations, etc.) that truly endanger a species presence within these Parks. About 10 person-days would continue to be spent annually on the Little Kern golden trout restoration program.

B. All Species Monitored:

These Parks would be thoroughly and systematically surveyed for these species, their actual status determined, and the vitality of populations monitored. If there are no (or few) within these Parks, the feasibility of their reintroduction shall be evaluated and implemented. Where appropriate, critical habitat would be identified. Management programs would be developed or modified on the basis of the surveys.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes:

A. Resources Management Actions:

(1) Develop and implement management programs based on the results of surveys.

(2) Continue NPS participation in the restoration of Little Kern golden trout.

(3) Reintroduce peregrine falcons to historic eyries if surveys establish reintroduction is feasible.

B. Monitoring Activities:

(1) Continue to conduct the annual empirical survey of the Little Kern golden trout in Soda Springs Creek, and initiate similar surveys in the Coyote Creek drainage.

(2) Maintain records of all endangered birds reported within these Parks.

(3) Monitor the status of any resident endangered birds located during the surveys.

(4) Monitor status of any reintroduced peregrines.

C. Research Activities: (See N-13)

(1) Conduct a survey of these Parks for peregrine falcon to determine their current status, to evaluate potential habitat, and to search for historic records of their presence.

D. Interpretive Activities:

The interpretive staff will discuss endangered fauna in an interpretive evening program on the wildlife of these Parks. Recognition of these species, their importance in the ecosystem, and the reporting of sightings will be stressed.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - $800.

B. O.N.P.S. Funds Requested:

(1) Recurring funds for monitoring and management - $21,000 per year at five year intervals.

(2) Non-recurring funds for peregrine reintroduction - $8,000.

C. Funding Source Requested - Regionwide Natural Resource Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-23-CAVE MANAGEMENT:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

The Park has a significant cave resource. At least 70 caves are known within the Parks. Some are well known and Lilburn Cave is the second largest cave in California. However, management of this resource is diffused between too many individuals to be effective. Cave management is coordinated by the Environmental Management Committee, though all Park Divisions have an interest in some phase of their management. Cave resources are extremely delicate and essentially non-renewable. This leaves no latitude for errors in their management, mistakes could be irreparable. The Parks currently lack sufficient personnel and expertise to adequately manage its cave resources.

(1) Goal:

To protect speleothems, other physical features, and each caves' ecology from human alteration while providing opportunities for public enjoyment and appreciation of karst resources.

(2) Objectives:

a. To acquire personnel to provide full-time support and coordination of the cave management program.

b. To provide a variety of opportunities to explore caves ranging from a developed trail with lights to unguided trips by permitted groups of qualified spelunkers in caves designated for such activities.

c. To clarify and manage each cave in accordance with its resources and hazards.

d. To closely monitor the effects of use on cave resources.

B. Past Actions:

The Park has some records on its cave resources and a cave inventory was completed by the Cave Research Foundation in cooperation with the Park. Information describing several of the caves has been published; this can be detrimental to their security to the extent that their locations are revealed. Several of the caves are gated and locked. A Cave Management Plan is being prepared.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

The cave management program will continue to be poorly coordinated and the likelihood of doing irreparable damage to this outstanding natural resource will be high.

B. Acquire Position and Support for a Cave Specialist:

Proper management of caves requires specialized knowledge and skills. One full time Cave Specialist (GS-7) and a temporary Park Technician (GS-5) will be added to the staff.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes personnel to be responsible for:

A. Management Actions:

(1) Coordinating all cave management activities.

(2) Establishing reasonable carrying capacities and use limitations on each cave.

(3) Serving as liaison between the Park and caving organizations such as CRF and NSS.

(4) Attending professional meetings on cave management.

(5) Developing and maintaining a cave management plan that will insure the safety of cave visitors and protect the cave resource from misuse.

(6) Recommending appropriate management for each Park cave.

(7) Developing and implementing a permit system to monitor use and control cave access, except for guided tours in Crystal Cave.

B. Monitoring Actions:

(1) Monitoring the impact of existing use.

(2) Insuring that existing and future gates are not detrimental to their respective caves.

C. Research Actions:

(1) Searching for, exploring, and inventorying new caves.

(2) Maintaining the cave inventory.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $35,300.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-25-RESTORE ABANDONED TRAILS AND ROADS TO NATURAL CONDITIONS:

2. STATEMENT OF PROBLEM:

Where front country trails, roads and buildings have been relocated and/or abandoned and steps were not taken to naturalize the sites or retard the development of erosive process significant damage to Park resources is occurring. Displacement of soil, gullying, denudation of slopes, and unsightly scars on the landscape are all taking place in varying, but increasing degrees.

The above will occur in Giant Forest after all facilities, except for three historic structures, are eliminated in 1990. This removal is part of the Clover Creek development.

If restoration is not performed erosion will increase, espe cially in times of heavy runoff and on steeper slopes. Scars from erosion trenches will deepen and multiply and soil will be displaced and deposited in streams.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Abandoned trails, roads and old building sites would not be restored to natural conditions. This would result in increased erosion and severe impacts to the natural resources.

B. Restore Only Trails, Roads and Old Building Sites to "Natural" Conditions in the Giant Forest Area:

All disturbed areas resulting in the elimination of the developments in the Giant Forest area would be restored t natural conditions. After restoration, prescribed fires would be used to perpetuate the Giant Forest area. Beneficial impacts include elimination of man's impact from denuding the soil and elimination of hazard tree removals Costs to maintain a safe environment for visitors from hazard trees would be virtually eliminated.

C. Restore All Frontcountry Trails, Roads, and Old Building Sites to Natural Conditions:

Same as Alternative B except that abandoned trails, roads and old building sites in all park developed areas would be restored to "natural conditions." Impact would be the same as Alternative B except for increased cost.

4. RECOMMENDED COURSE OF ACTION:

Alternative C is the preferred alternative. The basic principles of soil and moisture conservation would be applied to abandoned trails, roads, and old building sites. Such applications include the construction of water turning devices, revetments, and establishment of vegetation on denuded sites. All abandoned trails, roads, and old building sites would be restored to "natural conditions" for first year. Thse areas would be maintained in "natural conditions" every three years.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $26,900 for one year; $9,000 every three years to maintain "natural conditions."

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-31a-MITIGATION OF BEAR/HUMAN INTERACTIONS:
(Included as part of RM-42)

2. STATEMENT OF PROBLEM:

A. Current Conditions:

The interaction between bears and visitors has created serious problems in recent years. This interaction has resulted in:

- Many bears acquiring unnatural foraging habits
- The destruction of up to 10 bears annually by management (about 40 destroyed during the last 10 years)
- Some visitors illegally shooting bears that raid their campsite
- Some visitors being injured by bears (at least 16 during the last decade)
- Visitors incurring up to 621 incidents and $67,400 annually in property damage.

Information is insufficient to accurately assess the long-term impact of current losses to the Parks' bear population. Unacceptable threats to visitor safety and their property result without this information. Such incidents leave these Parks extremely vulnerable to tort litigation.

There are occasionally incidents involving guns, visitors, and bears. One visitor shot a bear near a park visitor center. Visitors have reported other visitors with guns chasing after bears, and several visitors have reported hearing low caliber gun shots when bears were in the area. Not only is there a high probability of bears being illegally killed or wounded, there is a high risk of another person being shot, wounded, or at least having property damaged by carelessly aimed rounds.

The main cause of the human/bear interaction problem is availability of human food and changes in bear behavior

to exploit that food. Human food is available for exploitation by bears because of improper food storage and garbage disposal by park visitors. Bears are extremely intelligent, and when provided an opportunity, they quickly learn to seek food from people.

(1) Goal:

To restore and perpetuate the natural distribution, ecology, and behavior of black bears free of human influences.

(2) Objectives:

a. To minimize the availability of human food sources and human activities which may significantly modify bear populations.

b. To minimize unpleasant interactions between bears and people and mitigate such interactions when they occur.

c. To provide opportunities for visitors to understand and appreciate the black bear in its natural environment.

Since 1972, the bear management program has been moving toward correcting the human causes of the problem rather than merely responding to the symptoms. The program operates on the theory that eliminating the availability of human food to bears will eliminate conditions that cause wild bears to alter their natural foraging habits and become destructive and dangerous. To accomplish this, the program components are:

a. Educate visitors about the nature and cause of the bear problem and how they should properly store their food and dispose of garbage when in bear country.

b. Enforce regulations regarding food storage and garbage disposal.

c. Provide bear-proof food storage and garbage facilities.

d. Mark, identify, and handle problem bears, as necessary, to avoid continuation of bad habits.

e. Monitor the bear population and experiment to find better ways to mitigate the bear problem.

Even though a decade has elapsed since these Parks initiated a bear management program based on the elimination of human food, the program has never been fully implemented. There continues to be sufficient non-compliance, perpetuating bear problems. Food-storage regulations continue to be inconsistent with recommended procedures for food storage and the disposal of garbage. Some areas of these Parks lack bear-proof garbage facilities, and, in some areas, existing facilities are not adequate. Last summer garbage cans overflowed nightly in the Lodgepole Campground area. The Camp Kaweah area is often a problem, because people have to walk too far to empty their garbage, or else, when the dumpsters are used, they are not latched.

Marking, identifying, and handling problem bears is an important aspect of the program. There are only two bear technicians to cover the entirety of both Parks; sometimes their services are requested by as many as five areas at once. Lodgepole alone is a full-time job for two people.

Monitoring has only been accomplished as a by-product of the bear research program. The small amount of time spent on management studies (like the backpacking bear-proof food-canister project) have only been possible by outside assistance and by taking time from other aspects of the bear management program.

B. Past Actions:

Prior to 1972 bear management consisted of either destroying or relocating problem animals. Since 1979, these Parks began putting radio transmitters on relocated bears. The results indicate that bears that fail to return typically roam out of these Parks, then disappear (presumably poached). Since this monitoring began, there have been no known successful relocations. If bear problems are to be avoided without killing bears, the cause of the problem must be corrected.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

The program would continue at the current level of implementation.

(1) Consequences: The estimated property damage will probably continue to increase. These Parks' staff will have to continue killing some problem bears. Many visitors will become disenchanted with these Parks' management of bears and the low level of bear protection they receive. Occasionally visitors will be injured; eventually someone may be killed. Some visitors will illegally shoot bears, and there will continue to be a high risk of a visitor shooting another visitor or a park ranger in the dark. Current bear management goals and objectives will not be achieved.

B. Continue in the Current Management Direction with a Fully Implemented Bear Management Program:

Mitigate the bear problem through bear-proof facilities, public education, enforcement, population monitoring, dealing, as necessary, with those bears that continue as problems. Implement research to answer unresolved management problems such as rehabilitation techniques for problem bears and the development of backpacking food-storage canister.

(1) Consequences: This is an intense program dependent on a higher level of funding than currently exists and a sustained high level of public contact and facility maintenance. It requires a team approach. This program needs about a quarter of a million dollars in non-recurring expenditures for food-storage facilities, and recurring funds for their maintenance and to bring the bear management staff up to standard. Years such as 1982 will continue to be the norm unless the program is adequately funded or these Parks adopt a more liberal interim policy for managing bears.

C. Discard Existing Goals and Objectives for the Bear Management Program, and Replace Them with Provisions for Public Safety and Maintain Black Bears as a Species Rather than as a Natural Population:

Install no additional bear-proof facilities nor make any changes in the existing level of visitor contact. Destroy any bear remotely suspected of causing incidents in any area, including the backcountry.

(1) (Consequences): These Parks would be managing a hunted population, and visitors would probably see fewer bears. However, the number of incidents, estimated damage, and the cost of operating the bear program would drop substantially. Professional support needed to run the program would also drop. The program would probably generate considerable controversy.

D. Put More Energy into Warning People of the Bear Problem and Let Them Take Their Chances. Make No Changes in the Existing Facilities, Policies, or Staff:

(1) Consequences: Current goals and objectives would not be achieved. Incidents and property damage would probably increase. Bears would congregate around developed areas. Bear-caused injuries could become more common along with tort claims. The public trust and respect for park rangers would be undermined. However, the operating cost would be less than or equal to the current program (excluding property damage and tort claims).

E. Relocate All Front Country Overnight Facilities to Areas Outside of Summer Bear Habitat. Make No Changes in the Existing Goals and Objectives or Increases in Facilities or Staff:

(1) Consequences: This choice would be very expensive and likely to encounter extensive public and political opposition, but it would probably be supported by conservation organizations as a move toward more pristine conditions. It would result in eliminating overnight facilities at Cedar Grove, Grant Grove, Lodgepole, Clover Creek, Dorst, Giant Forest, and Mineral King. Existing facilities would be either eliminated entirely, moved out of these Parks, or moved to the Ash Mountain-Potwisha area. The latter would result in the displacement of considerable oak woodland-chaparral, a habitat poorly represented in most other parks. The bear management program would require very little energy to achieve its goals and

objectives in the front country, and the existing staff would have more time to manage backcountry bear problems. Removing facilities from bear habitat would also eliminate much of the hazard tree problem, thus improving safety and much of the existing maintenance cost.

F. Enclose All Overnight Facilities With a Bear-Proof Exclosure. Maintain the Existing Goals and Objectives and Make No Changes in the Existing Staff:

(1) Consequences: This too could achieve our goal and objectives in the front country using a low-energy program, leaving the existing staff more time to manage backcountry bear problems. The initial cost of the exclosures would be high, and there might be a high annual maintenance cost to repair snow and tree damage and vandalism. This choice would probably receive little public or political opposition except by groups concerned about the appearance of the exclosure. Though many visitors would sleep more securely, some would object to both the appearance and inconveniences caused by the exclosure. Also, the presence of the exclosure might connote an undesirable message to the visitor about the area outside the compound.

G. Exclude All Tent Campers from Front Country Campgrounds; Only Allow RV's Larger than Vans or Similar Rigs. Maintain the Existing Goals and Objectives and Make No Changes in the Existing Staff:

(1) Consequences: Based on our current experiences, initially this should cause a major drop in front country bear incidents, leaving the existing staff more time to manage backcountry bear problems. However, in the absence of tent campers and their vulnerable cars, bears would likely learn to break into RV's. This choice would receive considerable public opposition.

4. RECOMMENDED COURSE OF ACTION: Alternative B. Full implementation of the existing Bear Management Plan.

A. Resources Management Actions:

(1) Maintain all bear-proof food storage lockers.

(2) Use bear-proof garbage facilities in all developed areas, and implement collection schedules that minimize the quantity of garbage present during the night.

(3) Perform public contacts to actively educate all park visitors about the cause and nature of the bear problem, particularly what they must do to avoid contributing to the problem.

(4) Enforce food-storage and garbage disposal regulations.

(5) Mark, identify, and handle bears as necessary to avoid initiation, perpetuation, or escalation of bad habits as appropriate.

(6) Continue to develop backpacking food-storage canisters and make them available to the public.

(7) Acquire night optics to facilitate identification of problem bears.

B. Monitoring Actions:

(1) Monitor the effects of the bear management program on bear population trends and behavioral habits.

(2) Monitor the effectiveness of the bear management program.

C. Research Action:

(1) Investigate techniques to rehabilitate bears that become problems. Since relocation is not effective, the only current way to stop bears that have acquired bad habits is to destroy them.

D. Interpretive Actions:

Interpreters will continue to communicate food storage problems to park visitors during evening campfire program introductions. Articles will be prepared by interpretive and resource management personnel interpreting bear/human interactions, and the goals and objectives of this program. An interpretive evening program will be developed about bears in at least the Cedar Grove and Lodgepole areas relating these problems, goals and objectives.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - $43,100.

B. O.N.P.S. Funds Requested: $42,000 Recurring;
$10,200 Non-recurring (FY-1)
(Included as part of Inc. No. 161 on Natural Resources Projects Programming Sheet).

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-32-DEER MANAGEMENT AND MONITORING:

2. STATEMENT OF PROBLEM:

   A. Current Conditions:

   Recent changes in management direction are expected to have significant effects upon the extent and quality of deer population levels within these Parks. The eventual implementation of a full scale burning program in chaparral and foothill ecosystems and the closure of the Mineral King area to hunting are principally responsible for these expected changes. The California Department of Fish and Game (CDFG) has expressed concern that expanded populations will have adverse effects on habitat outside the park and that the vigor of the population will decline.

   Deer populations are generally reported to be declining throughout the state. There is some evidence that local herds have not followed this trend. It has been hypothesized that a critical micronutrient (selenium) has become unavailable to deer through a chemical process initiated by sulfate in acid precipitation. Park herds may provide an important link in determining whether this hypothesized threat is real, and if so, to unveil the differences between areas that do and don't show effects.

   Deer enclosures and browse and pellet transects have not been systematically read recently. Their distribution and abundance are insufficient for reliable population estimates and trend analysis. Implementation of a deer monitoring program will provide information necessary to assess trends and evaluate California Department of Fish and Game proposals that affect those deer sharing land administered by other agencies.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

   A. No Action:

   Effects of prescribed burning and the end of hunting on the Mineral King herd and other deer populations will remain unknown. Understanding status and trend of deer populations will be limited.

B. Implement a Parkwide Deer Monitoring Program:

A program to systematically monitor population dynamics, (herd composition, favoring success, mortality sources, etc.), and population levels in all park herds would be implemented. Herd status and habitat condition would also be monitored. The monitoring program will provide necessary information for evaluating proposed and on-going management activities.

C. Implement a Deer Monitoring Program for the Mineral King and Kaweah watershed Deer Herd(s):

These herds are probably influenced by recent or projected management activities. The monitoring program described in B, could be implemented in these areas only.

4. Recommended Course of Action:

Alternative B is recommended. A parkwide deer monitoring program should be implemented. The prescribed fire program is projected to expand rapidly over the next few years. Adjacent land managers may employ actions that will affect park deer populations and habitat. The National Park Service should have specific knowledge of the status of all these Parks resident herds.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $10,400.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-33-AQUATIC/FISHERIES MANAGEMENT:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

The need to maintain natural fish population, yet sustain a viable sport fishery requires a thorough knowledge of: (1) sport fishing intensity, (2) angler success, (3) distribution of fishing pressure, (4) local fish population dynamics, and (5) the relationships of the preceding to these Parks' fishing regulations and management objectives. Maintaining a natural sport fishery is further complicated by a long tradition of stocking that has complicated future management options by: (1) populating numerous naturally barren lakes, (2) altering the natural distribution of fish, (3) introducing competitively superior exotic species, (4) modifying and sometimes destroying the original population through genetic introgression, and (5) creating a precedent which is socially and politically difficult to alter. Furthermore, these Parks have a federally listed threatened species, the Little Kern golden trout. The Little Kern golden trout needs full time involvement. Currently, the Fish and Wildlife Biologist is involved in administering many other programs and can devote only a portion of his time to the fisheries program. Additional personnel are needed to adequately implement and monitor the program.

(1) Goal:

To restore the natural distribution and abundance of native fish.

(2) Objectives:

a. To develop regulations and other management practices that favor the survival and perpetuation of native species over exotic fish.

b. To restore extant native species or genetically unique groups to their former range.

c. To allow waters incapable of supporting fish populations to become barren.

d. To mitigate human influences that effect the natural density and age-class distribution of native species.

e. To inventory the distribution and abundance of all fish species at 10-year intervals.

f. To monitor the distribution of fishing effort and fisherman success.

g. To enforce and document fisherman compliance with regulations.

h. To monitor effect of existing management practices on fish populations.

B. Past Actions:

Creel census and fish population studies began in 1980 to provide some management information. However, the data is preliminary and insufficient for a sound management program. These Parks collaborate with the California Department of Fish and Game on fisheries management issues and works with several agencies on the management of Little Kern golden trout.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

These Parks will not be able to adequately evaluate existing fishing regulations or other fish management activities (such as stocking) and will be poorly equipped to either improve the sport fishery or move toward a more natural fish population. Where stocking occurs, mistakes in selecting sites may continue to be a problem due to insufficient pre-stocking information as most of the survey data used now is outdated. These Parks will not be able to identify the distribution of exotic species, evaluate their actual impact upon native species and, where necessary, take action to stop their spread. There would be relatively little information on fisheries success or the population fished. Likewise, these Parks would be poorly equipped to respond to the occasional requests it receives for information on Park fisheries.

B. Abandon Fishing and Fish Stocking to Allow Fish Populations to Attain their Natural Equilibrium:

Many fishermen would be outraged about losing their right to fish, and this action would require a variance from current NPS policy regarding sport fishing in natural areas. Exotic species would continue to proliferate, and in some areas they would continue to displace native species. There would be no cost to managing the program, but law enforcement activities would have to be stepped up to enforce the closure. These Parks' staff would not have the inventory data needed to respond to public inquiries.

C. Provide Staff and Support for the Program:

Technicians will collect field data on distribution of fishing activity and fisherman success. Fish populations will be sampled to monitor seasonal and long term trends of fished and unfished populations. Technicians will maintain an inventory of the fishery resources (lakes and streams). Fish and Wildlife personnel will continue to collaborate with the California Department of Fish and Game on fishery programs. This information will be used to evaluate and revise (as necessary) existing fisheries management practices and regulations. The (PLTFT) Biological Technician will provide annual continuity, supervise field operations, and insure that the equipment is properly maintained.

4. Recommended Course of Action:

Alternative C which includes:

A. Resources Management Actions:

(1) Continue to participate in the program to restore the Little Kern golden trout to its former range.

(2) Develop and implement a program to manage Kern rainbow if they are present within these Parks.

(3) Develop and impose regulations that favor the natural abundance and size class distribution of native rainbow and golden trout and which are adverse to exotic brook and brown trout.

(4) Avoid planting any additional Park waters except as part of a restoration program.

(5) Develop program of public education regarding the fisheries management program.

(6) Actively enforce fishing regulations.

B. Monitoring Actions:

(1) Monitor the effect of existing regulations on fish populations.

(2) Monitor the distribution of fishing effort and fishermen success.

(3) Monitor the distribution and abundance of all fish species.

(4) Monitor level of compliance with regulations.

C. Research Actions:

(1) Conduct initial inventory on the distribution and abundance of all fish.

(2) Determine how fish alter ecosystem of high elevation streams and lakes.

(3) Determine the distribution and abundance of Kern rainbow in the Kern drainage.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - $1,200.

B. O.N.P.S Funds Requested - $34,000 Recurring
$ 5,000 Non-recurring (FY-1)

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-34-SUPPORT FOR WATER QUALITY MONITORING PROGRAM: (Included as part of RM-42):

2. STATEMENT OF PROBLEM:

A. Current Conditions:

A sound water quality program examines both chemical and biological indicators. Measurement of chemical properties provides an indicator of selected compounds at one point in time and does not show the impact of changes in the overall aquatic environment. The organisms that live in a stream are responding to their total environment. As fluctuations occur (due to changes in flow or chemical compounds), the organisms are present. While some organisms have wide tolerances for change, others have very narrow tolerances, and as such, are excellent indicators that a change in water quality occurred. This can indicate a possible change in one or several substances not measured (thus not detectable) in the chemical monitoring. However, without chemical monitoring, sources of change in aquatic systems cannot be identified. Both are needed: biologic monitoring to identify change, and chemical monitoring to identify what changed and attempt to locate its source or cause.

These Parks are not sufficiently equipped or staffed to measure all major chemical constituents or any biologic indicators except bacteria. Many samples currently have to be sent to other laboratories for analysis of constituents, and there is no capability for using algae and invertebrates as indicator organisms.

The current program is only funded for intermittant sampling of a few front country stations. Stations should be monitored throughout the year.

The impetus for a water quality monitoring program comes from the Federal Water Pollution Control Act Amendments of 1972 (PL92-500), the Clean Water Act of 1977 (PL95-217), Executive Order 11752 for prevention, control, and abatement of environmental pollution at federal facilities, and an Interagency Memorandum of Understanding between the EPA and NPS that provides for:

- "Identification of ambient conditions necessary for naturally balanced populations. . . "

- "Participate in review and revision of State water quality standards," water quality criteria, and development and implementation of water quality management plans.

- "Participate in assessment of water quality impacts of both point and non-point sources. . ."

- "Provide . . . technical material pertinent to NPS resource management concerns. . . "

- Compliance with State water quality standards and to "advise EPA and State agencies of NPS monitoring results which indicate pollution that threatens areas . . . under Service jurisdiction.

- ". . . to recommend to EPA, State and local agencies, the specific water quality standards and criteria necessary to protect such listed (threatened or endangered) species and their natural environment."

- Encourage exchange of information.

(1) Goal: To restore and/or maintain natural aquatic environments in which physical, chemical, and biotic processes function uninfluenced by human activities.

(2) Objectives:

a. To inventory and classify aquatic environments by physical and chemical characteristics and biotic communities present; identify both common and unique aquatic systems.

b. To maintain long-term monitoring stations in representative aquatic environments recording ambient conditions to document changes and trends; be able to detect and distinguish between diel, seasonal, and long-term shifts.

c. To locate and document the magnitude and direction of changes in aquatic environments which are caused by management activities or visitor use patterns; and to develop and implement management programs to mitigate those activities.

d. To detect and evaluate conditions characteristic of external influences such as acid precipitation.

e. To recognize aquatic conditions that are potentially hazardous to human health and safety, and to implement programs to advise visitors of health hazards and to take mitigating action where the cause is not natural.

f. To monitor the quality of water entering and leaving these Parks with regard to compliance with State and Federal standards for surface water.

g. To acquire sufficient knowledge about these Parks' water quality to be able to provide intelligent input into State and local water management planning.

h. To monitor water chemistry within Little Kern golden trout habitat.

B. Past Actions:

A monitoring program began in 1978 and was funded by the NPS Western Regional Office. The USGS implemented the program in 1978-1980, collecting data on 20 constituents at 65 stream stations (1978 and/or 1979) and establishing three stations that continuously monitored temperature, conductivity, and flow. In 1981, the USGS maintained their continuous monitoring stations, and these Parks' staff initiated monitoring water quality constituents with funds from the NPS Western Regional Office. In 1982, the program received ONPS base funding to support monitoring for four months of the year. With those funds, twenty permanent monitoring stations were established and additional monitoring was initiated on impacts associated with visitor use management. Monitoring continued through 1984. Funding cuts and higher priority needs reduced sampling in 1985, and eliminated sampling in 1986.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No action:

These Parks will not have adequate information to achieve its water quality objectives. The monitoring program will continue to be limited to intermittant measurement of physical properties, several chemical constituents, and bacterial counts during four months of the year and limited primarily to one major drainage. Funds will be inadequate to send samples to commercial laboratories to perform analyses that cannot be performed in-house. Technician support will be unavailable to respond to unanticipated events such as fish kills or to do routine monitoring of spray fields or long-term stations.

B. Increase Staff and Support Costs to Provide for Water Quality Monitoring Throughout the Year:

Staff and support costs will be available to maintain long-term monitoring stations, monitor waters crossing these Parks' boundaries, monitor aquatic impacts associated with various types of management practices, and have support to deal with unanticipated events such as fish kills. Tests that cannot be conducted at these Parks will be sent to commercial or other government labs. The program will gain long-term continuity, and employees will be able to deal with aquatic communities and indicator organisms as well as provide much better support on monitoring of physical and chemical properties.

C. Perform All Monitoring On Contract:

Monitoring would continue to be limited by existing budget. The interval between sample collection and reporting of results could extend from several hours to over one year. Response to unanticipated events, such as fish kills, would be difficult and sometimes impossible. In general, flexibility would be lost and costs per sample would increase. Much of the data collected might be of little value because of the sample's age when finally analyzed or deficiencies in the analyzing labs quality control.

Furthermore, personnel would be lacking on these Parks' staff to provide technical support on water management needs. This alternative would place these Parks in a very poor position to respond to its legislative mandates for water quality management.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes:

A. Resources Management Actions:

(1) Plan and implement management actions to mitigate human-caused problems identified by the monitoring program.

(2) Provide personnel and support to upgrade the existing monitoring program to become parkwide and operational during twelve months of the year.

(3) Provide input to State and local water management planning.

(4) Advise visitors of unsafe surface water conditions.

B. Monitoring Actions:

(1) Maintain long-term monitoring stations in representative aquatic communities to document changes and trends.

(2) Monitor effects of management activities and visitor use patterns on aquatic environments to identify man-caused problems and help establish carrying capacities. Maintain surveillance for external threats to Parks' water quality.

(3) Monitor the quality of water crossing the Parks' boundary.

(4) Monitor water quality within Little Kern golden trout critical habitat.

(5) Monitor for surface water conditions potentially hazardous to public health and safety.

C. Interpretive Actions:

Water quality problems and some potential solutions to these problems will be discussed among other items during interpretive backpacking programs, stressing appropriate toilet and washing techniques for both front country and backcountry.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - $ 15,900.

B. O.N.P.S. Funds Requested - $60,700
(Included as part of Inc. No. 161 on Natural Resources Project Programming Sheet)

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-36-MONITOR STATUS OF REINTRODUCED BIGHORN SHEEP:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

In the 1870's, herds of bighorn sheep estimated at 50 to 75 head were observed on the Great Western Divide in the Sawtooth Peak-Farewell Gap region. Other herds occurred along the crest of the Sierra. The herds rapidly declined during the first half of the 20th century. This appears to have been caused largely by competition and diseases from domestic sheep, and many of the bighorn were shot for meat. Today there are no known herds on the Great Western Divide and only two of the original herds remain on the Sierra Crest: the Mt. Baxter herd of about 180-200, and the Mt. Williamson herd of about 30. Sheep have been reintroduced at Mt. Langley, and sheep are also known to occur near Taboose Pass.

(1) Goal:

Restore bighorn sheep to their original range.

(2) Objectives:

a. Reintroduce sheep to those areas of the Great Western Divide where they are most likely to survive and proliferate.

b. Monitor the reintroduced population.

B. Past Actions:

Beginning in 1979, the California Department of Fish and Game (CDFG), working cooperatively with the Inyo National Forest (INF) took sheep from the Mt. Baxter herd for introduction at Mt. Langley, Wheeler Ridge, and Mt. Warner (the latter two sites are north of these Parks). The individuals on Wheeler Ridge are reported to be doing well, though many of the sheep taken to Mt. Langley were killed by predators. Preliminary surveys of the Great Western Divide indicated best potential reintroduction sites in Big Arroyo and vicinity.

3. ALTERNATIVES AND THEIR PROBABLE IMPACTS:

A. No Action:

A major high elevation ungulate will continue to be absent on its former range on the Great Western Divide. Since only one thriving herd exists, the race is very vulnerable to possible extinction caused by disease. The sooner more populations are established, the greater the chances of the race surviving. Bighorn sheep do not normally expand into new areas on their own, particularly when they would have to cross poor habitat to get there.

B. Reintroduce Bighorn Sheep to the Great Western Divide:

Bighorn sheep will have the opportunity to repopulate an area that once had large herds. With the establishment (restoration) of each new breeding population, the likelihood of disease destroying all of the Sierran bighorn is diminished.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes:

A. Management Actions:

A plan has been developed for the reintroduction, monitoring, and management of the herd. The reintroduction will be an interagency project involving the CDFG, the Inyo National Forest, and the NPS. A minimum of 25 to 30 head will be taken to each reintroduction site and will be dependent on the vitality of the Mt. Baxter herd.

B. Monitoring Actions:

Beyond the initial intensive monitoring, an annual census of the herd will be a continuing program.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $16,000 every five years for monitoring.

C. Funding Source Requested - Regionwide Natural Resource Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-37-LONG-TERM MONITORING OF NATURAL COMMUNITIES:

2. STATEMENT OF PROBLEM:

A principal function and responsibility of resource management is the systematic monitoring of natural communities status to detect and examine changes, and determine whether such change is the result of uninfluenced natural processes, management action, or direct user impact. Research may be necessary to partition the cause(s) of detectable change and identify mitigation strategies.

At this time there is no programatic approach to this monitoring nor is there any program which converts research study areas to long-term monitoring sites. Instead, as impacts to the natural resource become significant and undeniable (and perhaps irreversible) or interact negatively with visitor expectations or activities, special funds are made available to mitigate the situation. The result is that the resource absorbs a degree of modification that, without exception, could have been avoided or lessened if detected and mitigated earlier. A systematic ecological approach to natural resource monitoring would provide the information necessary to manage human influence upon park resources as an alternative to reacting to crisis situations. This approach would reduce the cost to both the resource and the treasury, reduce inconvenience to park visitors, and allow for a management scheme more consistent with NPS ideals and objectives.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Long-term monitoring of the ecological status, and the impacts of use and management upon natural communities will remain non-existent. Use-impact relationships will continue to be only generally understood and mitigation will occur only after development of serious problems. Insidious natural resource degradation will flare into significant resource problems. Park managers will lack sufficient information to adequately represent and protect resource values in the park planning process. Resource baselines and trendlines will be unavailable. Only those indicators of change that are obvious, or pose a threat to human health and safety will receive management attention.

B. Implement a Systematic Resource Status and Long-term Monitoring Program:

Monitoring of the ecological status of these Parks' resource base will establish a baseline from which trends can be measured via systematic long term monitoring. Concurrently, use inputs can be related to observable changes, and mitigation prescriptions or policy modifications formulated as appropriate. Crisis situations will be less likely to occur. Management focus will concern itself with the integrity of entire ecosystems rather than selected components.

C. Implement Research Included Within and Complimentary to the Monitoring Program:

Research may be necessary to partition the cause(s) of change in the observable status of the resource and to identify pathways and mechanisms for mitigation if appropriate. Such research will be conducted promptly as identified in natural resource management project statements and research plots will be used subsequently in monitoring programs.

Additionally, information gained through systematic long term monitoring will make available a large body of literature applicable to specific management questions.

4. Recommended Course of Action:

The no-action alternative is unacceptable. The recommended course of action is a combination of B and C. Funds available for conducting required research in a timely fashion need be made available. Such funds should be administered by Resources Management at the Regional level and be made available to Park Service researchers or for contracts, as specific projects are identified.

5. Funding

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $69,000.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-38-MONITOR THE EXTENT OF OZONE INJURY ON VEGETATION

2. STATEMENT OF PROBLEM:

A. Current Condition:

Ozone injury has been documented in the southern Sierra Nevada since 1969; ozone concentrations in SEKI have exceeded state and federal standards. The tolerances of the various plant species in these Parks to ozone are largely unknown; likewise, trends and dose-effects correlations are unknown. Without this basic knowledge, protection of ozone-impacted air quality related values (AQRV's), will be seriously hampered.

B. Past Actions:

National Park Service personnel have established since 1980, 54 permanent 10-tree ozone injury plots which could also be used to monitor other natural and man-caused impacts to the vegetation. Ratings of ozone injury on yellow pines in these plots ranged from no symptoms to severe symptoms; symptoms were present in 81 percent of the plots, and on 36 percent of the trees. Moderate to severe injury is concentrated in drainages which lead to the San Joaquin valley.

In 1983, an analysis of ozone injury on sequoia seedlings and black oak trees was begun; preliminary observations found definite oak injury and possible sequoia seedling injury. Work in 1987 is expected to continue for the yellow pine, black oak, and sequoia seedling plot evaluations, fumigation of sequoia and black oak seedlings, and tree ring analysis, all concerned with ozone effects.

Ozone concentration has been measured with California Air Resources Board monitor at Lodgepole and Ash Mountain since 1981, and at Lookout Point since 1982 by the EPA with a solar-powered monitor. These are expected to run perpetually.

3. ALTERNATIVE ACTIONS:

A. No Action:

Under this option, no evaluation of either ambient ozone concentration or sensitivity of park vegetation to these levels would be done. These Parks would rely on ambient readings of ozone taken by the state in distant (35 mile) locations, and on evaluation of symptoms on selected, commercially valuable species, such as ponderosa pine, done on National Forests. Giant sequoia injury and sensitivity would be unknown.

B. Monitor Concentration of Ozone and Effects on Selected Species:

Approximately 100 ozone injury plots will be established and monitored throughout these Parks in the 4,000 to 8,000 foot elevation range. This will enable the Park Service to evaluate the effects of ozone concentrations on vegetation. These plots will be monitored periodically to detect any changes in impact. Plots will be selected to include species which are known to be sensitive to ozone and are important air quality related values. Correlations will be worked out between dose and effects, recognizing that site characteristics influence response to ozone.

It is acknowledged that ozone is produced generally from non-point sources (automobiles). However, since a state ozone standard has been set, and this standard can be shown to be violated in SEKI, some relief is possible. Moreover, a correlation of dose versus effects will prove valuable should a move be made to relax this standard.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is the only method of meeting the affirmative NPS responsibility of protecting AQRV's. The identification of these ozone-impacted AQRV's, the establishment of permanent trend plots which are evaluated periodically, and the measurement of ozone concentrations using specified methods comprise a total ozone monitoring and effects program. Two individuals for 10 pay periods each will be the primary team to execute this program, continuing to evaluate plots established by Park personnel and USFS research scientists.

The creation of these positions will allow the research now being done, or planned to be done, on ozone effects (needle retention, timing of litterfall, tree growth and productivity, water stress, and photosynthetic rates) to be continued

as a long-term monitoring function. The conversion of studies from short-term research to long-term monitoring is critical in the management of species which are affected chronically and subtly by air pollution.

One interpretive evening program will be developed in each district discussing air quality and acid precipitation. This program will show problems, both actual and potential, and encourage visitors to explore solutions to these problems when they return home.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $15,500.

C. Funding Source Requested - Servicewide Air Quality Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-39-VISTA CLEARING:

2. STATEMENT OF PROBLEM:

Because of fire suppression and regeneration on disturbed road cuts and fills, plant succession along roadways has blocked many scenic vistas and interfered with sight distances along the roads. Many vistas and the roadside itself are blocked by thickets of young trees. In many areas, slopes and banks are eroding due to lack of soil stabilization, tree roots were cut leaving a potential hazard, and root disease has been introduced because of disturbance.

Vistas are needed to provide a better view of these Parks scenery for the visitor. An estimated 750 trees in the four to eight inch size class, many seedlings, and some shrubs need to be removed.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Without removal scenic vistas would continue to be encroached upon by the surrounding forests. Adverse impacts would be a lack of enjoyment of scenic views by the visitor, and encroachment of vegetation along roadsides reducing sight distances causing a safety hazard.

Beneficial impacts would be a savings in costs needed to maintain the vistas.

B. Clear all Identified Vistas:

A survey was completed in December 1983, that identified 23 existing or potential vistas. These vistas would be cleared to enhance visitor enjoyment and awareness as well as to provide for visitor safety. Vegetation would be removed by Park personnel.

Beneficial impacts would include increased visitor enjoyment of these Parks' scenery and reduced safety hazards due to vegetation encroachment onto roads. Increased costs would occur because of the need to keep the vegetation under control.

C. Clear Only Selected Vistas:

Of the identified 23 vistas, 10 are significant because of the outstanding views they provide. Under this alternative only these vistas would be cleared.

Probable impacts would be that the major scenic vistas of these Parks could be enjoyed by visitors and there would be reduced costs to maintain the vistas as compared to Alternative B.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is the preferred alternative. All identified vistas would be cleared and the views maintained.

A. Resources Management Actions:

Trees and shrubs would be removed on a four-year cycle. Specific actions include the following:

(1) All vista clearing and maintenance would be done under the direction of Chief of Resources Management.

(2) All trees and shrubs in the 23 vistas would be removed by Park personnel or on contract and would be sold as commercial timber or as firewood during year one.

(3) Prescribed burning and cutting would be used to maintain vistas as appropriate every four years.

(4) All vegetation removed from vistas would be "feathered" so no signs of cuttings are visible.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $ 24,600/year one; $8,000 every year to remove shrubs and $12,300 every four years to remove trees.

C. Funding Source Requested - Cyclic Maintenance.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-41-SUPPORT FOR AIR QUALITY MONITORING PROGRAM:
(Included as part of RM-42)

2. STATEMENT OF PROBLEM:

The Clean Air Act Amendments of 1977 established regulations whereby certain areas, including Sequoia and Kings Canyon National Parks, are protected by law as "Class I" areas. In these areas, the federal land manager has the direct responsibility for protecting the air quality. Not only are ambient levels of pollutants regulated, but any air quality related value (AQRV) which might be threatened by air pollution is also protected. AQRV's include visibility, flora, fauna, geological and cultural resources, human health, and water quality. The federal land manager has the responsibility to present scientifically sound evidence showing the existing or potential threat of a pollution source to these Parks' ambient air quality or AQRV's. Only through the implementation of a well-conceived, scientifically rigorous air monitoring survey as part of natural resources management in these Parks can this responsibility be met. Such a survey includes the monitoring of ambient air quality and the identification and continued surveillance of air quality related values.

These Parks possess an unique association of flora. It has become evident that the yellow pine plant community is threatened by the production of photochemical smog in the San Joaquin Valley air basin, and continued monitoring of these species is a high priority. Research on the effects of smog on giant sequoia seedlings is also being done. Oaks may prove to be another indicator of ozone impact.

Sulfates and nitrates derived from air pollutants and dissolved in rainwater pose a threat to the entire Sierran ecosystem. Continued and expanded monitoring of snow, fog, and rain water chemistry is necessary to the protection of park resources, and distribution of aquatic organisms should be monitored in order to evaluate any effects of acid precipitation on the ecosystem. Such changes are in direct conflict with the Biosphere Reserve status of these Parks.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action - Discontinue All Air Quality Monitoring:

Under this option, the state would monitor air quality around, but not in, these Parks. If the topography of these Parks were similar to areas monitored by the state, their monitoring would be sufficient. However, the levels, types, and patterns of air pollution in these Parks is significantly different from anywhere else in California.

Moreover, the state agencies are overworked in providing monitoring stations and cannot be expected to monitor these Parks.

In order for these Parks to protect air quality, management is responsible for documenting the levels, types, and effects of air pollution occurring in these Parks. If no baseline data are obtained, no trend or violation can be established, and the hands of the regulatory agencies are tied.

B. Continue to Monitor Air Quality at the Present Level:

(1) Rationale:

The monitoring of ambient atmospheric pollutants requires a careful sampling design. Meteorology and topography have direct influences on the surface circulation patterns which affect atmospheric pollution concentrations. Sequoia and Kings Canyon National Parks are located in the San Joaquin Valley Air Basin, an area which experiences temperature inversions most of the year with corresponding stagnant air. The height of the inversion layer often dictates the point at which trapped pollutants will impinge upon the mountain slope. However, upcanyon winds, common in the afternoon during the summer, draw polluted air upstream far above the top of the inversion, resulting in fumigation of the headwaters of east-west trending canyon systems, particularly the Kaweah River Gorge. For this reason, the most intensive monitoring should be centered on the Kaweah drainage. Ash Mountain and Giant Forest, above and below the inversion, are primary stations.

(2) Ozone:

Continuous monitoring of ambient ozone concentrations should be conducted throughout the season of

oxidant occurrence (about April 1 through November 30). At least three locations within the drainage, representing a low, middle, and high elevation site, should be included. Currently sites are positioned at Giant Forest (6,000 ft.), Lookout Point (4,000 feet), and Ash Mountain (1,400 feet). Preliminary monitoring at Cedar Grove has indicated that much lower concentrations of this pollutant occur in the Kings River drainage than in the Kaweah. No monitoring has been performed in the Kern or San Joaquin Basins. These sites should be considered important in order to provide an accurate description of the spatial distribution of atmospheric ozone throughout the entire park.

The instrument used for ozone monitoring is the Dasibi ultra-violet photometer. This machine requires weekly maintenance while operating. The data generated require some preliminary analysis in that data to California Air Resources Board (CARB) must be converted from rolls of graph paper to computerized input forms, a lengthy and tedious project. Currently two instruments are used on loan from CARB, one other is operated and maintained by EPA; the EPA device is solar-powered. It should be noted that ozone is considered to be the most important pollutant in the San Joaquin Valley air basin. Continued monitoring of its occurrence in Sequoia and Kings Canyon is of great importance to the support of the CARB monitoring network, and to CARB's regulatory efforts. In 1986, the NPS Air Quality Division purchased two sheds to provide a constant environment for the Dasibis. This will further enhance the quality of data.

(3) Particulates and Acid Deposition:

Total suspended particulates (TSP) occur in concentrations in excess of federal and state standards in the San Joaquin Valley Air Basin. The monitoring of this pollutant is essential to the protection of human health in Sequoia and Kings Canyon National Parks. Particulate material includes sulfate and nitrate aerosols, organic particles, airborn dust, toxic metals, and ash and soot from fires. Sulfate and nitrate particles may be deposited on surfaces and/or dissolved in rain, bringing about acid conditions.

The production of ash and soot during prescribed burning may bring about concentrations sufficient to pose a health hazard. Monitoring of pollution from this in-park source should be considered obligatory. Fine particles (0-2 um in diameter) have the greatest effect on human health and visibility. While the current state standard refers to TSP, a fine particulate standard is being considered by the EPA. The acid deposition research project also needs information on nitrate and sulfate dry deposition levels. For these reasons, the acquisition and operation of size-segregating particle sampler (stacked or dichotomous) should be considered a high priority. The state may install a statewide visibility/particulate monitoring network in the future. An excellent site for such a station, including a telephotometer and a dichotomous sampler, has been identified.

The existing design currently includes two non-size segregating TSP high-volume samplers. These are stationed at Ash Mountain and Giant Forest. The Ash Mountain instrument is operated throughout the year; a sample is taken every six days for a 24 hour period. The Giant Forest sampler is operated from May through November. Currently, precipitation collectors are operated at Giant Forest as part of the National Atmospheric Deposition Program (NADP) and the California Air Resources Board acid deposition study. These collectors require service once per week. An automatic weighing rain gage is also operated in conjunction with the precipitation sampler. A collector at Ash Mountain has been installed by CARB and will require similar service.

Bulk deposition collectors at the Elk Creek acid deposition study area were operated until June 1986 by Dr. Paul Miller, U.S. Forest Service, as part of a Man and the Biosphere research grant. The study is an integral part of dry acid deposition research in Sequoia and Kings Canyon and required Resources Management support for periodic (bi-monthly) collection of data and service of the equipment. A throughfall network was set up as part of the same study and required similar service. The collection of snow samples is currently handled by the research staff, but support from resources management should

be considered in the future, especially to convert the air quality research being done into long-term monitoring.

Under present funding, sufficient staff support exists for summer and fall sampling. However, winter and spring sampling is largely deferred due to lack of similar support. The patterns and quantities of air pollution are largely unknown during the winter and spring in these Parks.

(4) Visibility

An extensive visibility monitoring program, including all air basins having integral vistas, should be considered highly desirable. The documentation of visibility through color photography with automated cameras is a relatively easy and inexpensive means of obtaining data for remote vistas. Particulate loads can be estimated with photographs, if a correlation between visibility and particulates has been done. In 1983, two Olympus OM-2 cameras were obtained for this purpose; one takes a slide at 0800, 1200, and 1600, looking from Giant Forest down the Kaweah drainage. The other is portable, taking slides of various vistas.

(5) Monitoring Effects on AQRV:

The effects of air pollution on the flora and fauna of Sequoia and Kings Canyon National Parks must be documented, and over $115,000 of effects research on sequoia seedlings, black oak, and yellow pine has been done since 1982. Projects set for funding include the effects of air pollution on tree ring growth and on lichens.

C. Establish a Year Around Air Quality Monitoring Program and Monitor Additional Important Air Pollutants:

(1) Add $27,400 to base for air quality monitoring for one 12 month air quality monitoring technician. This will ensure adequate support for the entire year. The projects listed in B would continue.

In addition, the following are important air quality issues and should be included in the program.

a. Nitrogen Oxides and Sulphur Dioxide

While the measurement of dry gases may be considered impractical at this time, due to the constant maintenance the monitors require, at least some preliminary monitoring in the future should be considered in order to determine whether or not these gases exist in significant concentrations at Sequoia National Park. Oxides of nitrogen have been shown to occur at levels exceeding the state standards in Visalia. It is unknown if these gases are arriving in these Parks, or if they are converted to dry particles and deposited as dry deposition.

b. Carbon Monoxide:

Carbon monoxide may occur at localized points at levels hazardous to human health. Prescribed fires, wildfires, and motor vehicle exhaust are possible in-park sources that should be monitored. Sampling should occur on an event basis, in areas of suspected high CO concentrations.

c. Visibility:

The protection of visibility should be given high priority. A first step would be the installation and operation of a telephotometer at Ash Mountain. This instrument may be either manually or automatically operated. The manual model requires that an observation be made three times during the daylight hours, usually morning, noon, and afternoon, thus, it is an instrument requiring much attention. Automatic models are available. In conjunction with telephotometer readings, the EPA recommends a color photo be taken at the same time at telephotometer reading is made, the continuous operation of an integrating nephelometer and a fine particulate sampler, and meteorological measurements taken, including temperature, relative humidity, wind speed, and wind direction.

The expansion of this aspect of air quality monitoring would assist in both the preservation of the important AQRV of scenic vistas and in

the acid deposition research program. Fine particulate monitoring is the way to quantify the subjective AQRV visibility; regulating levels of dry acid deposition protects visibility. The development of a total visibility monitoring program in Sequoia and Kings Canyon becomes doubly useful because its data can be used in the acid deposition research project.

d. Long-Term Monitoring:

There is currently a great deal of research being conducted in these Parks on air pollution effects. All of these projects will end in the near future, but their established plots and measured levels of impacts can form an important baseline against which future trends can be compared. Increased support will allow the air quality monitoring program to use and to continue to follow the trends uncovered during research, thus bridging the gap between research and management. Support for biological effects studies (fumigation chambers, field plots, tree ring analysis, etc.) would also be available.

4. RECOMMENDED COURSE OF ACTION:

A. Monitoring Actions:

The preferred option is C, with B being done in the absence of increased funds. The advantage of C is the greater capacity for monitoring additional, potentially important, pollutants, and for year around monitoring which provides a more accurate picture of the total air quality issue.

Options B and C do not usually involve the purchase of capitalized equipment; rather, these Parks provide personnel to run equipment provided by state and national monitoring networks, such as the National Atmospheric Deposition Program. This allows us tying into existing networks, with established quality assurance standards, and often with regulatory power.

B. Interpretive Actions:

All interpretive activities that incorporate scenic views

will include comments on the quality of the air. The interpretive comments should provide information that will keep the park visitors aware of air quality problems and allow them to understand their own role in the problem, its analysis, and possible solutions. Each season, all seasonal interpreters will receive training and an update on the status of our air quality monitoring program and the changes that have occurred during the past year.

5. FUNDING:

A. Recurrent Funds Available in Park Base - $23,300.

B. O.N.P.S. Funds Requested - $27,400
(Included as part of Inc. No. 161 in Natural Resources Projects Programming Sheet).

C. Funding Source Requested - Servicewide Air Quality Base Program.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-42-BRING NATURAL RESOURCES MANAGEMENT PROGRAMS TO MINIMUM STANDARDS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

The natural resources management program consists of a wide variety of programs designed to perpetuate the natural ecosystems of these Parks so they may operate essentially unimpaired by human interference. Impacts from man to the natural resources are significant and prevent the "perpetuation of natural ecosystems." For example, bears and hazard trees in developed areas are removed to provide safety for park visitors. The more trees and bears that are removed, the greater the impact on these resources. Air and water pollutions from man have the potential to affect entire ecosystems, thus irreversibly changing the natural resources we are mandated to protect. In addition to protecting the natural resources from man, we must provide a reasonable degree of safety for visitors from bears, hazard trees, and air and water pollutions.

Problems of high priority include bear management, hazard tree removal, and air and water pollution monitoring and are discussed below:

(1) Mitigation of Bear Human Interactions:

Once bears learn to associate food with people, their normal behavior is modified and they routinely exploit park visitors' food. This problem is further enhanced by uninformed or careless visitors. The interaction between bears and visitors in recent years has created serious problems (a total of 1,974 incidents from 1982 through 1986) and resulted in high property losses (a total of $174,454 estimated damage) and potential for serious personal injury (15 injuries from 1984 through 1986, and 16 bears killed). The object of the bear management program is to minimize this interaction with elimination of all available unnatural food sources and education of park visitors.

(2) Hazard Tree Removal:

During 1982 and 1983, a total of 38 trees failed in developed areas causing an estimated $213,000 damage to structures. The three trees that were identified as hazards caused $182,000 of this damage. Because of inflation and budget cuts and the loss of U.S. Forest Service funds in 1980, removal of the originally identified 6,000 hazard trees in developed areas has not been completed. In addition, 200-300 hazard trees must be removed annually to provide an essential level of safety for people and structures.

Natural tree failures in developed areas can be expected to increase and inflict serious property damage to government or concession facilities estimated at a value of $50,000,000, and/or personal injury or death to visitors or employees. Since 1970 there have been two fatalities, nine personal injuries and an estimated total of $312,600 in property damage through 1985. Expensive tort claims could result from such additional failure. Maintenance of the program at below minimum standard invites additional potential death, personal injuries and/or property damage.

(3) Air and Water Pollution Monitoring:

Air and water pollution are recognized as having potential to seriously impact park natural resources. For example, high ozone levels have already affected yellow pine and could affect giant sequoia. Summer rain storms have had a ph as low as 3.5. Also, since these Parks' surface waters are poorly buffered, nutrients from human waste and acidic deposition could cause major changes in the ecological structure aquatic communities. These Parks' waters are particularly vulnerable to high levels of visitor use and certain type facilities like sewage spray fields. Present funding allows for summer and fall air and water quality monitoring only, but not winter and spring. The levels and nature of air and water pollution must be monitored year round to reach minimum standard.

B. Past Management Actions:

(1) Mitigation of Bear/Human Interactions:

Up until 1972, bear management consisted primarily of either destroying or relocating problem animals. Since 1979, these Parks began putting radio transmitters on relocated bears. The results indicate that bears that fail to return typically roam out of these Parks, then disappear (presumably poached). There have been no known successful relocations since this monitoring began. If bear problems are to be stopped without killing bears, the cause of the problem must be corrected.

(2) Hazard Tree Removal:

Trees identified as hazards were first removed in the 1960's by the Maintenance Division. Potential hazards along roads, backcountry and high-use front country trails, and in developed areas were detected, inventoried and removed with assistance from the park forester. The concessionaire was responsible for hazard tree removal on lands it leased within these Parks. In 1968, Director George Hartzog placed this responsibility under the National Park Service.

Other alternatives used have been the now dismantled Western Tree Crew, loan of personnel from other parks, contracts with local loggers and concessioner-contracted wood cutters. While there have been a few attempts to sell hazard trees, in many cases it is not economically feasible because of the high percentage of cull and limited, scattered volumes. There have been a few exceptions however. In 1967, 1,405 roadside trees between Grant Grove and Lost Grove were sold in a cooperative timber sale with the U.S. Forest Service.

(3) Air and Water Quality Monitoring:

A water quality monitoring program was initiated in 1978 and funded by the NPS Western Regional Office; the U.S. Geological Survey implemented the program in 1978-1980, collecting data on 20 constituents from 65 stream stations (1978 and/or 1979) and establishing three stations that continuously monitored temperature, conductivity, and flow. In 1981,

the U.S. Geological Survey continued their continuous monitoring stations, and these Parks' staff initiated monitoring water quality constituents with funds from the Western Regional Office. In 1982, the program received ONPS base funding to support the monitoring for four months of the year. With those funds, twenty permanent monitoring stations were established and additional monitoring was initiated on impacts associated with visitor use management.

Air pollution monitoring began in 1974 when ozone injury symptoms were detected in these Parks on yellow pines by the USFS. In 1980, NPS personnel began to establish permanent plots to document trends in ozone injury; by 1983, 54 plots were established, aided by funds supplied by the NPS Division of Air Quality. In 1983, the study was expanded to include black oaks and sequoia seedlings by contracts established with the U.S.Forest Service and U.C. Riverside. These studies have detected significant levels of ozone injury on yellow pine and black oaks.

In 1981, SEKI and the California Air Resources Board (CARB) agreed to establish Hi Volume particulate and Dasibi ozone monitors in these Parks as part of the statewide network. Base funds were obtained in 1981 to provide technician support for these activities. In 1983, an acid deposition monitor was added by CARB in addition to the National Atmospheric Deposition Program Monitor established in 1980 as part of a national network. In 1982, these Parks were selected as research areas to study the long term effects of acid deposition, as part of a national acid deposition effects study, which is expected to last 10 year.

In 1983, two automatic cameras were obtained which take photographs three times daily from park integral vistas, which were documented in 1980. These slides show dramatic changes in visual range and quality, both diurnally and annually. Future emphasis should be on the correlation of fire particulate levels with visual effects. Dry deposition particulates have an effect on visibility, but have not been studied except as

part of the Man and the Biosphere (MAB) contract established to study dry deposition in chaparral in 1983.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action

Bear management, hazard tree removal and air and water quality monitoring would be discontinued. This would result in:

(1) More bears becoming problems to visitors, increased personal injury and property damage, and an unnatural bear population.

(2) An intolerable increase in personal injury, property damage, and possible death from falling limbs and trees.

(3) Air and water pollution continuing to seriously impact park resources.

B. Operate the Bear Management, Hazard Tree Removal, and Air and Water Pollution Monitoring Programs at the Current Level:

Bear management, hazard tree removal, and air and water quality monitoring would continue at the current level of implementation, well below minimum standard. With no action the following would occur:

(1) A high number of bear incidents risking public property safety, and six to 15 bears killed annually.

(2) Increased chances of tree failures causing personal injury and property damage and subsequent tort claims.

(3) The inability to monitor potentially critical impacts of air and water pollution to park resources during winter and spring.

C. Increase the Bear Management, Hazard Tree Removal and Air and Water Pollution Programs to Perpetuate these Natural Resources and to Provide Adequate Safety For Man:

Under this alternative, the following will be done:

(1) The bear problem would be mitigated by removing the cause through public education, enforcement, population monitoring, dealing with those bears that continue to become problems and by implementing research to answer unanswered management problems.

(2) All high hazard trees (priority 6 and 7) will be removed from each developed area every three years. Moderately hazardous trees (priority 5) as well as high hazard trees will be removed annually from around structures that are occupied year round. All sites will be completely cleaned up and returned to "natural" conditions. Some 400-500 trees will be removed each year.

(3) Air and water pollution monitoring will be expanded to a year round program. The air quality monitoring program would be expanded to monitor the oxides of nitrogen and sulfur, carbon monoxide, visibility and the effects of air pollution on AQRV's. Pollutants, currently being ozone, particulates, and acid deposition, would be monitored year round. All parameters identified in the Aquatic/Water Resources Management Plan would be monitored.

(4) Support for these programs will provide additional clerical assistance, data management with a computer, and quarters for personnel.

4. RECOMMENDED COURSE OF ACTION:

Alternative C is the preferred alternative.

A. Mitigation of Bear/Human Interactions:

(1) Use of bear-proof garbage facilities in all developed areas, and implementation of collection schedules that minimize the quantity of garbage present during the night.

(2) Perform public contacts to actively educate all park visitors about the cause and natural of the bear problem, particularly what they must do to avoid contributing to the problem.

(3) Enforce food-storage and garbage disposal regulations.

(4) Mark, identify, and handle bears as necessary to avoid initiation, perpetuation, or escalation of bad habits as appropriate.

(5) Continue to develop backpacking food-storage canisters and make them available to the public.

(6) Monitor the effects of the bear management program on bear population trend and behavioral habits.

(7) Monitor the effectiveness of the bear management program.

(8) Investigate techniques to rehabilitate bears that become problems. Since relocation is not effective, the only current way to stop bears that have acquired bad habits is to destroy them.

B. Hazard Tree Removal Actions:

(1) Remove approximately 400-500 moderate to high hazard trees annually from developed areas.

(2) Dispose of all logs, limbs and slash by lopping and scattering, or by firewood sales and timber by timber sale.

(3) Treat all stumps with borax to prevent inoculation by Fomes annosus.

C. Air and Water Pollution Monitoring Actions:

(1) Monitor additional air pollutants and current pollutants on a year round basis.

D. Water Pollution Monitoring

(1) Plan and implement management actions to mitigate human-caused problems identified by the water quality monitoring program.

(2) Provide personnel and support to upgrade the existing monitoring program to become parkwide and operational during 12 months of the year.

(3) Provide input to State and local water management planning.

(4) Advise visitors of unsafe surface water conditions.

(5) Maintain long-term monitoring stations in representative aquatic communities to document changes and trends.

(6) Monitor effects of management activities and visitor use patterns on aquatic environments to identify man-caused problems and help establish carrying capacities. Maintain surveillance for external threats to Parks' water quality.

(7) Monitor the quality of water crossing these Parks' boundary.

(8) Monitor water quality within Little Kern golden trout critical habitat.

(9) Monitor for surface water conditions potentially hazardous to public health and safety.

(10) Inventory and classify these Parks' aquatic environments by physical and chemical constituents and biotic community structure and composition.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - $198,500.

B. O.N.P.S. Funds Requested - $202,700 Recurring.
$9,000 Non-recurring YR-1.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-43-MONITOR PARTICULATES AND EFFECTS ON VISTAS AND HEALTH:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Visibility has been identified as a critical Air Quality Related Value (AQRV), particularly as a source of visitor enjoyment of these Parks. However, vistas of these Parks are frequently obscured by haze originating from the San Joaquin Valley; general winds carry air pollution eastward and into SEKI, reducing visibility to a few miles. The amounts of these fine particulates, as well as their composition, are largely unknown. There is also no correlation between levels of particulates and visual range, and it is unknown if these particulates are occurring in levels hazardous to the health of certain sensitive members of the population. The San Joaquin Air Basin counties are all in a non-attainment status for particulates.

EPA has also considered setting standards for fine particulate levels, which could have a severe impact on the prescribed burning program of these Parks since smoke produces large quantities of fine particulates. Since no fine particulate baseline exists, the contribution of smoke to this baseline is unknown. Park management may be forced to shut the prescribed burning program down if it cannot be demonstrated that its smoke is harmless. Therefore, the gathering of data for establishing fine particulate levels is fundamental to the protection of park values.

B. Past Actions:

These Parks have on loan from the California Air Resources Board three hi-volume particulate samplers, two of which are used and are part of the state's particulate monitoring network. These monitors do not stratify fine particulates, and are limited in their usefulness; if the EPA focuses on fine particulates, they are essentially worthless.

These Parks obtained in 1983 two automatic Olympus OM-2 cameras, which take three pictures each day; one is

currently pointing down the Kaweah drainage and has provided park managers with the best evidence to date of vista obscurement. Once correlations of particulate levels and visibility are established, these photos can be used to determine current levels, and help to establish trends in visibility.

3. ALTERNATIVE ACTIONS:

A. No Action:

Fine particulate levels would remain unknown, and these Parks would not be able to take steps to protect AQRV's which are adversely affected by this form of pollution. The prescribed fire management program could also be affected, perhaps even closed down. The affirmative responsibility of park managers to protect air quality would not be performed.

B. Establish a Fine Particulate/Visibility Monitoring Station:

By obtaining two fine particulate samplers to replace the current hi-vols, managers could focus on the primary causes of visibility impairment caused by artificial sources. One sampler at the bottom of the Kaweah drainage, with another at 6500 feet in the same drainage, covers the effects of inversions and local meteorological effects. A telephotometer would provide information on visibility by quantifying the loss of contrast due to air pollution or natural causes. In conjunction with the automatic cameras and automatic weather stations already in the park, information would be collected on causes of visibility impairment, and provide data with which regulatory agencies can correct the impairment. Fine particulate data can also be used by the many agencies interested in dry acid deposition.

4. RECOMMENDED COURSE OF ACTION:

Only alternative B fulfills the federal land manager's responsibilities under the Clean Air Act to protect Air Quality Related Values.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $28,000 first year
$12,500 thereafter

C. Funding Source Requested - Servicewide Air Quality Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-44-DEVELOP FACILITIES TO SUPPORT BIOSPHERE RESERVE NATURAL RESOURCE PROGRAMS:

2. STATEMENT OF PROBLEM:

   A. Current Conditions:

   As an International Biosphere Reserve, Sequoia and Kings Canyon National Parks have a commitment to support comprehensive natural resource management and research programs. Current facilities are inadequate. The resources management and research staffs at Sequoia and Kings Canyon have outgrown the available office, laboratory and field housing facilities. The expanded natural resources programs that have been required to address high priority management, monitoring and research problems necessary to assure the protection of the very ecosystems for which the Parks were created do not have adequate facilities to support those programs. Office space in the administration building is insufficient for even the permanent professional staff. Seasonals are forced to work in condemned buildings or in the conference room of the Research Center. No adequate laboratory facilities are available for vegetation, soils, or wildlife work. Housing for both resources management and science staff and visiting scientists is also limited. Adequate field housing and work space are not available for crews working in many outlying areas of these Parks. No space is available for the projected purchase of computers to store the developing resources data base. These facilities are urgently needed to support even the ongoing program.

   B. Past Actions:

   During the past several years the Resources Management Division has been forced to expand into several old residences that have been condemned for overnight occupancy. A permanent quarters has been converted into a Research Center that provides a meeting room, one office, dormitory space and a modern wet laboratory.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

   A. No Action:

Under this alternative it will be necessary to halt the expansion of both the resources management and research programs. The point at which no additional space is available for carrying out funded programs has been passed. It will be impossible for the Parks to fulfill their role as a fully functioning Biosphere Reserve.

B. Develop Facilities to Support Natural Resources Programs:

This alternative would fund the reconstruction of two condemned residences to accommodate office and laboratory needs. The main building, laboratory and upstairs workspace at the Research Center would be modernized and expanded to better accomodate existing needs. In addition, either trailers will be purchased or small field buildings constructed to accommodate field housing and laboratory needs at selected outlying Park areas. Special attention will be given to developing housing and work space for natural resource programs in the Giant Forest/Lodgepole area.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is recommended. This will provide necessary facilities to accommodate an expanding natural resources program.

5. FUNDING:

A. Recurrent Funds Available In Parks' Base: None.

B. O.N.P.S. Funds Requested: $80,000 per year for each of two years.

C. Funding Source Requested: Servicewide Natural Resources Preservation Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-46-EXCLUDE TRESPASS CATTLE AND CONTROL ROAD EROSION IN BIOSPHERE RESERVE.

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Trespass grazing by cattle is a problem in the North Fork and main stem of the Kaweah River. Impacted areas include: (1) the area above the flume between Tunnel Rock and the Park boundary; (2) the area immediately above the Kaweah #3 power plant; the lower portion of Yucca Creek; (4) North Fork several kilometers upstream the confluence with Yucca Creek; and (5) the road north of Yucca Creeg to Grunigans. The precise area effected needs to be surveyed. Impacts include trampling of wetlands, conversion of grass to feces, formation of cattle trails, extra erosion, fecal deposition in streams, destruction of sedges growing along the North Fork, and erosion in an abandoned road.

(1) Goal:

Eliminate trespass grazing.

(2) Objectives:

a. To establish and maintain an impenetrable barrier between Park lands and adjacent ranch land.

b. To increase enforcement of regulation prohibiting trespass grazing.
c. To prevent continued erosion from an abandoned road into Yucca Creek.

B. Past Actions:

Ranchers have periodically removed cattle and maintained existing fence. However, as many as 27 have been counted at one time.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Existing resource impacts will continue.

B. Construct Fence along Entire Boundary:

This alternative is not feasible because the boundary of much of the effected area follows the west shore of the North Fork. Each spring floodwaters would wash out much of the fence creating a larger resource problem.

C. Construct Fence above Floodplain on East Side of River, Elsewhere Restore Fences along Boundary:

A major Park river would continue to be impacted by cattle.

D. Construct Fence above Floodplain on West Side of River, Elsewhere Restore Fences along Boundary and Control Erosion on an Abandoned Road:

The Park would have to get permission from BLM to implement this alternative. Devices may be needed to bring water up from the river for cattle on the BLM allotments. Also, during low water conditions, a barrier gate would be needed where the river crosses the fence. However, if maintained, this alternative would keep trespass cattle out of the Park and protect the North Fork from grazing and nutrient impacts. Erosion would be controlled.

E. Increase Law Enforcement Patrols and Penalties:

This could improve the problem, but without any barrier along the North Fork during low water conditions, the problem will continue.

4. RECOMMENDED COURSE OF ACTION:

Alternative D which includes:

A. Research Actions:

(1) Define the precise limits of the problem area.

B. Management Actions:

(1) Secure permission and funding to fence BLM side of North Fork, to repair fences and gates on boundary, and to construct appropriate structure across river and control erosion on the abandoned road from Yucca Creek to Grunigans.

(2) To increase patrols and strictly enforce regulations.

(3) Maintain fencing as needed.

C. Monitoring Actions:

(1) To periodically inspect area for evidence of trespass grazing; also to inspect condition of fence.

5. FUNDING

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $198,000 for fence construction, $50,000 for erosion control, and $20,000 per year thereafter for increased patrol ($17,100) and fence maintenance ($2,900).

C. Funding Source Requested - Park Base; and Cyclic Maintenance.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-47-MONITOR EFFECTS OF KAWEAH NO. 3 WATER DIVERSION:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

The Kaweah No. 3 Power Plant was constructed in 1907. It is licensed to divert water from the Marble and Middle Forks of the Kaweah River for generation of electrical power. The water is diverted approximately four miles upstream from the Parks boundary. While this diversion only results in a net loss of <20 percent of the river's flow during spring runoff, it may be as much as 90 percent of the flow during base flow conditions in December. The reduced flow has resulted in: (1) increased river warming rates below the diversion, (2) more extensive formation of algae mats, (3) slight reduction in invertebrate diversity and an increase in number of individuals, (4) diversion of some fish into the flume and direct loss of stream habitat with reduced flows, (5) reduced vigor of certain riparian tree species, and (6) altered migratory patterns of deer and caused some increased mortality.

In addition to direct impacts to the aquatic system, the physical structure of the flume does result in some animal losses and probably alters natural animal movements. As the structure gets older, additional repairs will be needed. Complete structural failure of any section of wall could result in major erosion.

(1) Goal:

To monitor existing environmental impacts caused by the water diversion system and be able to recognize and abate any additional impacts before they become serious or unrepairable.

(2) Objectives:

a. To monitor the status of known environmental impacts caused by the diversion.

b. To monitor the status of sensitive resources within the affected area.

c. To monitor the status of selected organisms that may indicate a significant change the streams ecology both upstream and within the effected area.

d. To evaluate and implement, where possible, ways of mitigating historic, new, and potential impacts

B. Past Actions:

The impacted section of stream has been studied by the National Park Service from 1964 to 1978. More recently, a private firm contracted to the NPS studied it from 1980 to 1984 and prepared a report that was transmitted to Congress as part of a legislative mandate to evaluate the impacts of the power plant.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

We will continue to not achieve any of the above objectives

B. Only Monitor Compliance with Permit Requirements:

This is done now to the extent practical with existing personnel. However, this only provides information on compliance with minimum flow requirements and the general nature of maintenance operations. It does not achieve the stated objectives.

C. Implement a Comprehensive Monitoring Program:

Such a program would achieve the above objectives and provide information on which to intelligently reevaluate future licensing of the facility.

4. Recommended Course of Action:

Alternative C which includes:

A. Monitoring Actions:

(1) Monitoring the status of known environmental impacts.

(2) Monitoring sensitive aquatic resources.

(3) Monitoring select organisms above and below the diversion to detect to significant changes in the stream ecology that may be caused by the diversions.

(4) Monitor permit compliance.

(5) Evaluate data to mitigate existing, new, and potential impacts.

5. FUNDING:

A. Recurrent Funds Available in Park's Base - None.

B. O.N.P.S. Funds Requested - $25,000.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-48-MONITORING IMPACTS OF DEVELOPED SITES:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

Several recent Environmental Assessments and one facility permit called for environmental monitoring around developed sites. Subjects to be monitored included water, soil, and vegetation. These areas are primarily streams and forests near sewage sprayfields and meadows from which water is removed. However, with extensive plans for more development at Clover Creek and Grant Grove, the need for such monitoring can be expected to increase.

(1) Goal:

Detection and complete mitigation of anthropogenic effects.

(2) Objective:

a. To accurately detect the and locate the source of any anthropogenic contaminant likely to cause significant changes to undeveloped areas.

B. Past Actions:

Past monitoring has been minimal and accomplished primarily by borrowing from other projects. The terms of one permit have already been violated for lack of monitoring. Previous monitoring consisted primarily of aqueous nutrients, fecal bacteria, and some vegetation and soil sampling.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

The program would continue at current level of implementation or lower as additional budget cuts are absorbed.

B. Fund at Necessary Level:

Monitoring needs would be achieved. Anthropogenic

impacts could be detected for all measured variables allowing for corrective action to be taken.

4. RECOMMENDED COURSE OF ACTION:

Alternative B.

A. Monitoring Actions:

(1) Expand existing environmental monitoring programs in both the Resources Management and Maintenance Divisions as appropriate.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None except as described under other programs from which this monitoring has been borrowed (e.g. water quality monitoring).

B. O.N.P.S. Funds Requested - $80,000.

C. Funding Source Requested - Park Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-49-PLANT NURSERY OPERATIONS:

2. STATEMENT OF PROBLEM:

In 1984 these Parks received $30,000 to implement a landscaping plan around the newly constructed Lodgepole Market. To date, approximately 710 native wildling trees and shrubs have been transplanted by hand or with Tree Spade. This project, for all intense purposes was completed in 1986. Cone collection began in 1984 and over the past three years over 170 bushels have been collected and sent to the US Forest Service Placerville Nursery for seed extraction, processing and propagation. The first of the bare-root seedlings grown from seed collected in 1984 were received during the winter of 1985-86. Trees are currently being grown for planting of the Lodgepole Market, Clover Creek/Red Fir, Giant Forest, and Cedar Grove. Additional trees will be grown from seed collected in 1986 for Lodgepole, Clover Creek/Red Fir, and Cedar Grove. Virtually all existing and proposed developments within these Parks require or will eventually require revegetation/landscaping.

Approximately $20,000 of the construction funds allocated to these Parks for the Lodgepole Market landscape project were utilized to construct a small containerized nursery at Ash Mountain. The nursery site is in the employee residential area on the former sites of a quarters and the original Park nursery. Park Maintenance, Resources Management and volunteer labor cleaned up and graded the site, installed an irrigation system, shade houses, and greenhouses, laid gravel ground cover, constructed a rock retaining wall, shed, and soil bin, and made improvements to an existing garage. Left to be completed are installation of a fertilizer injector, construction of another greenhouse, and modifications to a refrigerated trailer unit for seedling storage.

Currently there is funding available to complete the nursery, but none to obtain necessary supplies, or hire anyone to operate the nursery.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

This alternative would essentially put an end to the

recently revived revegetation program in these Parks. The nursery would be completed but with no operating funds, would cease to operate as soon as funding being diverted from other projects is exhausted. Any revegetation/landscaping would have to be done with non-native species/seed source which would be inconsistent with Park objectives.

B. Complete and Operate Nursery with Existing Funding:

The nursery would be completed and operated with Vegetation Monitoring or other Resources Management base account funds. Operation would be at less than full potential or facility and production would not meet revegetation/landscaping requirements.

C. Complete and Operate Nursery with Additional Funding:

Nursery would be completed according to development plan and operated to full potential. Adequate planting stock would be supplied for landscaping/revegetation projects in Clover Creek/Red Fir, Grant Grove, Giant Forest and other developed areas in the Parks.

4. RECOMMENDED COURSE OF ACTION:

Alternative C is the preferred alternative. This alternative would provide for adequate source of plants and for landscaping/revegetation of new and existing developments. Native plant species and seed source would be maintained, erosion potential reduced, and environmental impacts of past and future development mitigated.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $25,000.

C. Funding Source Requested - Park Base.

6. REFERENCE:

Warner, Tom, and Tim Stubbs. 1984. Development plan for park nursery, Ash Mountain, Sequoia and Kings Canyon National Parks. 7p.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-RM-50-EVALUATE ENVIRONMENTAL EFFECTS CAUSED BY MINERAL KING DAMS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Four dams were built in the Mineral King area between 1903 and 1912 and prior to its inclusion into the National Park System. These damns were built for the purpose of retaining water during spring runoff to be released during the late-summer dry period. This extra water then provided extra flow for capture and diversion outside the Park where it is used for electrical power generation. The continued presence of the dams is a man-made intrusion in a natural area and a source of un-natural alteration of late-summer flows. The ecological impact of this alteration is unknown.

(1) Goal:

To recognize the ecological impacts of the presence and use of the dams.

(2) Objectives:

a. To quantify the impact of the dams on the lakes in which they enhance water retention.

b. To evaluate the environmental impact of operating the dams on downstream sites.

c. To evaluate the short and long-term ecological and economic impacts of removing the dams and/or terminating their use.

d. To evaluate the impact of the dams on recreation and wilderness qualities.

B. Past Actions:

The dams were evaluated as part of the Developmental Concept Plan for the mineral King Basin.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Ignorance is not bliss! We will continue to permit an activity that may be impacting the resources and which has little if any environmental or economic justification.

B. Implement a Study:

A good study will permit an objective evaluation of whether or not operation of the dams should continue and whether it is environmentally feasible to remove them.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes:

A. Research Actions:

Implement a research study that achieves the above objectives.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $30,000 per year for three years.

C. Funding Source Requested - Regionwide Natural Resources Base (Research).

NATURAL RESOURCES MANAGEMENT STATEMENT

1. SEKI-RM-55-BEAR LOCKER MAINTENANCE:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

Over 1,100 bear-proof food-storage lockers have been installed in front country campsites and some trail heads during 1982-1986. As the lockers age, required cyclic maintenance includes painting, replacing broken snaps, hammering out minor dents, restenciling information on door, controlling rust, and replacing units that have received major damage.

(1) Goal:

Maintain lockers at each campsite (except at Grant Grove) and at designated trailheads.

(2) Objective:

To maintain presentable appearance and total functioning of all food lockers.

B. Past Actions:

Damaged or stolen lockers were replaced by Maintenance personnel with extra units kept for those purposes. Minor damage was repaired opportunistically by either Resources Management or Maintenance personnel. Lockers have not been painted but occasionally require some cleaning.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Units will become unsightly, rusty, and gradually become inoperable. Campers at those sites will become the principal victims of bear incidents, and the bear problem which has improved since installation of the lockers can be expected to deteriorate.

B. Repair at Five-Year Intervals:

Hire a two person crew (WG-7 and WG-3) at five-year intervals for 10 pay periods to paint all lockers, perform all necessary maintenance to include welding, and replace lockers as necessary. Purchase 100 lockers every 10 years to replace units that are not repairable.

C. Repair at Two-Year Intervals:

Extend two existing seasonal positions (WG-7 and WG-3) for two pay periods every two years to perform all necessary painting and maintenance on 20 percent of the existing food lockers. Purchase 100 lockers every 10 years to replace units that are not repairable.

4. RECOMMENDED COURSE OF ACTION:

Alternative C which includes:

A. Management Actions:

Every two years, approximately 20 percent of the food lockers would have rust removed and be painted. Stenciled messages on the lockers would be repainted. Broken snaps, chains, and hinges would be repaired. Lockers that were not repairable would be replaced. Cement pads would be replaced as necessary. Some lockers would be moved as needs changed.

5. FUNDING:

A. Recurrent Funds Available in Park Base - None.

B. O.N.P.S. Funds Requested - $15,000 per 10-year interval; $3,500 per two-year interval.

C. Funding Source Requested - Cyclic Maintenance - Natural Resources.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-13-ECOLOGICAL STUDIES OF RARE AND EXTIRPATED SPECIES:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

The disappearance, or decreased abundance, of species as a result of human activities opens many questions as to the effects of such occurrence on natural ecosystem processes. Studies are needed both on the effects of the loss of extirpated and rare species on Park ecosystems and the current status of such species.

Six plant species that have been Federally listed as candidates for threatened status are known to occur in Sequoia and Kings Canyon National Parks (Federal Register September 27, 1985). One endangered animal species, the peregrine falcon, has also been recently observed in these Parks although little is known of the potential of this area for nesting and other habitat requirements. Other species, such as the grizzly bear and black tailed jackrabbit, which once occurred in the Park are now locally extinct. National Park Service Management Policies and the Endangered Species Act require an understanding of the current status of these species.

In addition, a number of other plant species are unique to these Parks and require management consideration according to National Park Service Policies. Several additional fauna species (especially a number of the furbearing mammals) are currently under consideration for threatened status by the Fish and Wildlife Service. Little is known about the basic biology and ecology of any of these species. These Parks' fire management program as well as possible threats from other park operations and visitor use require park managers to know the risks and impacts of such activities on populations of rare species.

In several cases the species of concern are so rare as to cause serious alarm as to their future health and survival. Baseline data on the status and ecology of each species is badly needed.

B. Past Actions:

Field work conducted during the summers of 1980 and 1981 inventoried 158 sensitive plant species populations, 85 of which were known prior to the inventory and 73 of which were discovered during the course of the field work. No species-specific studies have been conducted to evaluate the status of these populations, including the potential effects of fire, fire suppression, or other management action on any of the species.

Historic nesting and observation records for peregrine falcons in these Parks' vicinity have been reviewed. Staff have kept abreast of work by other agencies in survey and restoration work, and established professional contacts. Preliminary survey work has been conducted in a few locations. Systematic surveys to evaluate the status of other considered fauna species have not been conducted.

In addition, the ecological ramifications of the disappearance of rare or extirpated species on Park ecosystems has potentially significant ramifications.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

Required compliance with the Endangered Species Act and NPS Management Policies leaves no alternative but to study the biology and ecology of rare species, particularly in reference to human disturbances and fires. The lack of knowledge of how ecosystems have changed as a result of man's activities limits the accuracy of management programs.

4. RECOMMENDED COURSE OF ACTION:

The various plant and animal species that have been reviewed for threatened classification or are considered unique or extremely rare in occurrence within these Parks will be prioritized and species-specific baseline ecological studies undertaken on the top priorities to evaluate their health, including the effects of fire (or fire suppression), visitgor use and other management actions on them. Available information from other sources will be utilized to the extent possible. Studies will focus on threats to species distribution and status, reproductive biology and fire adaptations. The rare furbearers will be given special attention.

A review of the possible impacts of extirpated species will be conducted, including recommendations regarding the desirability and feasibility of reintroductions.

This work will be carried out over a four year period.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $37,000 per year for four years.

C. Funding Source Requested - Regionwide Natural Resources Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-15-FIRE HISTORY/ECOLOGY IN GIANT SEQUOIA ECOSYSTEMS:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

The fire management programs for the giant sequoia-mixed conifer forest zone of Sequoia, Kings Canyon and Yosemite National Parks call for the use of prescribed fire to reduce unnatural fuel accumulations as a prerequisite to restoring natural fire regimes. In most cases this stop-gap measure is thought to be necessary before natural ignitions can be allowed to burn. In other cases prescribed fires may have to simulate natural ignitions in perpetuity. Now that these Parks have active, base funded fire management programs it is essential to understand the long-term fire history as well as the effects of fire interval and intensity on different ecosystem parameters if we are ever to be sure that natural fire regimes have been restored. At this time, little information is available on the pre-settlement, and even less on the pre-Indian, fire regimes of the giant sequoia-mixed conifer forests (a major reason for the formation of Sequoia, Kings Canyon and Yosemite National Parks). Likewise, little is known about the effects of fire on such parameters as forest structure and succession, insect and disease organisms, fine roots and mycorrhizae, nutrient cycling, litter dynamics, reproduction, mortality, growth dynamics, erosion, rare and alien species, and fauna for even the primary ecosystems of the large Sierran Parks. The natural functioning of each of these communities is threatened without knowledge of the effects of both natural and man created fire regimes. The interpretation of the role of fire in the giant sequoia and other sensitive ecosystems badly needs additional information on both the history and effects of fire and fire suppression.

In addition, the Parks fire management programs are in need of quantitative standards to guide decision making on where, when and how to burn given areas.

Information on historical fire regimes and fire effects need to be combined with computer models of fuel accumulation and fire behavior and spread to assist in making

such decisions. If models are to be useful they will need to be fully evaluated and the necessary background data collected for key park ecosystems.

The chances of doing a creditable job of restoring fire to its natural role in park ecosystems, which is a fundamental park goal, is seriously impaired without such basic data.

B. Past Actions:

The limited fire history data is available from fire scar records for the Redwood Mountain Grove of Kings Canyon National Park. This research was carried out in the early 1970's and is limited to an area known to have an exceptionally high lightning strike incidence. No similar data is available for any other Sierran park communities. While some data is now available on the effects of fire in certain ecosystems, it is not adequate to fully assess the impacts of varying fire regimes. This is especially true for the giant sequoia groves where, an active prescribed fire program is underway, many questions must be resolved before it can be fully effective in achieving park objectives.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If the proposed research is not carried out, park managers will soon face a difficult decision on how to proceed with the prescribed burning program. In the case of sequoia mixed-conifer forest communities information is now available that will allow for the use of prescribed burning to reduce existing fuel buildups. Unfortunately, there is little biological information available to assist park managers in determining what constitutes "unnatural" fuel buildup, what the short and long term objectives of fuel reduction burns should be, and in deciding what should be done after these first fuel reduction burns. The decision of whether to burn again and at what interval and with what size and intensity fire or whether to allow lightning ignitions to follow the first prescribed burn would have to be made without the benefit of biological information on the fire history and ecology of the areas. The consequences of decisions made without the benefit of such information could be

analogous to that of the disastrous 1978 Ouzel fire in Rocky Mountain National Park.

The lack of knowledge on the potential spread of ignitions from outside the park boundary or fires suppressed for safety or political reasons would mean that these potentially important fires would not become a part of future fire regimes--which as a result would result in an artificial expansion of future fire free intervals.

B. Carry Out Research on Fire History and Fire Effects Focused in the Giant Sequoia-Mixed Conifer Forest Zone:

It is proposed that a several faceted study be undertaken. The study would be closely coordinated with and partially carried out in Yosemite. A primary aspect of this study will involve detailed fire history investigations of the giant sequoia mixed-conifer forest zone. This will involve looking at fire scarred trees through such means as increment cores, wedges and wafers. Attention will also be given to the possibility of using such techniques as charcoal sediments in meadows to evaluate past fire histories. Special attention will be given to expanding the existing data base for the Redwood Mountain Grove to include other sequoia grove areas within these Parks. Sequoia stumps at such places as Converse Basin and Atwell Mill will be evaluated for their potential in extending fire scar data back as far as several thousand years. Paleohistorical research will focus on understanding vegetation history in the sequoia zone through the use of pollen and plant macrofossils. Attention will be given to looking at both spatial and temporal variability.

Fire frequencies, sizes, and intensities prior to influence by European man will be investigated. The extent to which factors such as slope, aspect, and topographic features affect fire frequency and behavior also will be evaluated. Fire behavior relative to fuel loading, topography, and fire weather conditions will be quantified as input for the development of prescriptions for refining the fire management program. Attempts will be made to identify potential "routes" of catastrophic fire for inclusion in Park and interagency management and contingency plans.

Existing lightning strike, fire spread and fire succession models will be evaluated for potential use in park

management. Data acquisition needs, such as fuel accumulation rates, plant succession and demography, etc. will be identified and field studies designed. The goal will be to develop a fire model that adequately simulates the fire regime for key park communities. Such a model must provide quantifiable standards against which managers can evaluate the success of their program.

The final aspect of this package will focus on better understanding the effects of varying fire intensities and frequencies on biotic and abiotic parameters. The study of fire effects will consist of a number of subprojects. These will include an evaluation of insects and disease, the susceptibility of fire scars and the fine root-mycorrhizal association to different intensity fires, forest structure and successional patterns, soil nutrient cycling, erosion, air quality and potential impacts to rare and alien plants.

4. RECOMMENDED COURSE OF ACTION:

A. It is recommended the proposed studies be carried out in full. They should be closely coordinated and integrated with needs and staff in Yosemite. This is the only way that these Parks will ever be able to have the type of background information necessary to carry out a truly effective natural fire program. The study is proposed as a five year study to be carried out by both park staff and contracting with university scientists as appropriate. This project has been designed as a coordinated effort with Yosemite. It represents SEKI's portion of a combined submission that includes YOSE-N-35.

5. FUNDING:

This project has been conceptually broken down into four separate studies. The in-house forest structure, fuel accumulation and modeling project, a fire history study using stumps, a paleohistory study of vegetation and fire history, and a fire effects package. The first project is currently scheduled for funding from the Regional Office at a level of $50,000 for year one and $70,000 for each of four succeeding years. The following funds are still required:

A. Recurring Funds Available in Parks' Base - $32,500 for the first year of the paleohistory study.

B. Total O.N.P.S. Funds Requested -

(1) $50,000 for year one and $40,000 for each two succeeding years to fire history contract.

(2) $30,000 for years two and three to complete paleohistory contract.

(3) $60,000 for each of three years to carry out fire effects studies.

Total Funds Requested: Year 1: $110,000; Year 2: $130,000; Year 3: $130,000.

C. Funding Source Requested - Regionwide Natural Resources Base (Research) and NRPP.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-16-SUCCESSION IN MOUNTAIN MEADOWS:

2. STATEMENT OF PROBLEM:

   A. Current Conditions:

      Conifers (especially lodgepole pine) and several species of willow have colonized substantial portions of some montane and subalpine meadows since the establishment of these Parks. Pre-Park and more recent human activities (grazing, fire suppression, etc.) are generally suspected to have affected the rate and extent to which these invasions have progressed. However, it is thought that individual meadows respond differently to these influences due to their different histories and environments. In recent years, management activities, including the removal of lodgepole pine, have been suspended because of a lack of knowledge about the degree of naturalness, origin, age structure, and current rates of these invasions into individual meadows. Before further action is taken, it is important to determine if historic invasions proceeded at different rates than are now occurring, and to what extent current and historic invasion is related to natural factors (climatic events, etc.) and/or human influences in individual meadows. Little is known about the ecology and dynamics of willow and other woody species in montane and subalpine meadows.

   B. Past Actions:

      Meadows with significant lodgepole pine invasions have been identified. Age structure data has been collected for only one meadow but has not been analyzed. Partial records exist of past management actions to remove invading lodgepole and willow from selected meadows.

3. Alternative Actions and their Probable Impacts:

   A. No Action:

      If this study is not carried out continued lodgepole and willow encroachment will likely continue in many meadows. No actions will be taken unless it is clearly documented that encroachment is an unnatural phenomenon caused by previous management or use activities. The major problem

with this alternative is the difficulty in determining whether encroachment is natural or unnatural.

In the meantime, many of these Parks' backcountry meadows may suffer lodgepole invasions.

B. Carry Out Studies of Encroachment Into Park Meadows:

Studies should be carried out to determine if historic invasions proceeded at different rates than are now occurring and to what extent current and historic invasion is related to unnatural factors in specific meadows. As a first step, the Parks' meadows should be physiographically classified to identify stable, dynamic and sensitive meadows so that potential study sites could be identified. Historic visitor use and climatic data (as indicated by snow survey and river flow records or tree ring chronology) will then be summarized for each meadow having significant lodgepole or willow invasion. The age structure and rates of invasion for individual colonies will be determined in each meadow. The success of past removal actions will be evaluated. Experimentation with different removal techniques (grazing, mechanical and chemical) will also be evaluated. Biotic and edaphic characteristic of invaded areas will be recorded in order to enhance knowledge of the dynamics of invasion and develop a classification system for invasion types and prediction of future invasions. Recommendations will be made for management actions based on the findings.

4. RECOMMENDED COURSE OF ACTION:

A. It is recommended that the research identified under alternative B be carried out. It is anticipated this study will be carried out over a four year period. The study will be carried out by park personnel.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $30,000 per year for four years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-19-ASSESS EFFECTS OF FIRE ON FAUNA:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Little is known about the present distributions or densities of most vertebrates in these Parks. Prescribed burning and the restoration of natural fire cycles can be expected to alter the status of most faunal species within fire types, both directly and through changes in vegetation structure and type. Unless measurements are taken before extensive burning, there will be no way to evaluate changes in faunation induced by fire. In the particular case of mule deer (Odocoileus hemionus) in the Sierra, absence of fire in chaparral has been proposed as the most important contributor to declines in abundance. Major herbivores such as deer and their vegetation prey exist in dynamic equilibrium that has been largely unstudied with respect to fire in the Sierra Nevada. For small mammals, extensive burning may lead to profound changes in species composition and abundance by altering food and cover.

B. Past Actions:

The scientific literature suggests alteration in animal populations for many years after fire, and reciprocating impact of some herbivores on vegetation in the years after a major fire. One local study of rodent population fluctuations after a chaparral fire has been conducted. N-21, the Ecological Database Project, has been mapping distribution of animal and plant species.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If this study is not undertaken, management actions of substantial and far-reaching consequences will take place with inadequate measure of their effects on Park fauna. Moreover, interpretation of vegetation response to fire may be frustrated by the impact of large changes in the rates of herbivory.

B. Carry Out Demographic Study of Selected Vertebrate Species Following Fire:

Because data on species as diverse in their ecologies as reptiles, amphibians, birds, and mammals should be collected, many different type-specific techniques for censusing animals will be employed, and will be integrated with monitoring of vegetation regrowth. Baseline (control) and experimental plots will, insofar as possible, be those used for vegetation studies. Trapping and marking will be used for some terrestrial species, while sign may be used for others, observation and song for birds. The complex nature of the undertaking will require substantial baseline information on plants and abiotic resources.

4. RECOMMENDED COURSE OF ACTION:

The proposed studies should be carried out as three years of intensive research and establishment of repeatable measurement. They would then be followed be periodic monitoring in each fire type for one full fire cycle.

5. FUNDING:

A. Recurrent Funds Available in Parks Base - None.

B. O.N.P.S. Funds Requested - $25,000 per year for three years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-22-REINTRODUCE BIGHORN SHEEP:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

Bighorn sheep (Ovis canadensis) were once extant throughout the mountains of the western states, but are now reduced to remnant herds. In the Sierra Nevada, the two surviving native herds both include Sequoia and Kings Canyon National Parks within their summer ranges. They winter on the eastern slope, outside the Parks. A large and well-known herd of bighorn sheep once occupied the Great Western Divide above Mineral King until the 1920s, when it was eliminated--presumably--by hunting and perhaps diseases from domestic sheep. Consequently, since that time a substantial portion of these Parks has been absent its principal alpine herbivore. This represents a fundamental aberration of that ecosystem. Secondly, since the present remnant herds winter outside the Parks, they are subject to actions by other federal and state agencies. A reintroduced Mineral King herd would reside entirely within Park boundaries. Surveys of hypothetical summer and winter ranges for reintroduced bighorn indicate that habitat has not changed and is capable of supporting a herd of sheep.

B. Past Actions:

Cooperative research by the National Park Service and the U.S. Forest Service was conducted during the 1970s to establish the status of extant remnant herds, and to determine where sheep had occurred during historical times. During the past several years, bighorn have been trapped and removed from the larger [Baxter] herd and relocated to three sites in the Sierra Nevada where sheep once occurred. Unfortunately, the fate of two of these introduced bands has been monitored to only an extremely modest extent while the third, along Yosemite's Tioga Pass, has been monitored intensively. Likely summer and winter ranges in the proposed Mineral King introduction site have been surveyed by air and on foot, and found to contain necessary habitat parameters. There are published management plans for the entire Sierra Nevada population (interagency) and the SEKI herds supporting the Mineral King introduction.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If the proposed introduction and herd establishment research are not conducted by the National Park Service, we expect that the California Department of Fish and Game will propose to introduce sheep into Mineral King at some future date, but without any systematic followup research.

The National Park Service would be faced with alternatives of denying permission to introduce sheep and thus perpetuating the present unnatural ecological conditions, or permitting a resource management action of substantial consequence without proper research and monitoring.

B. Introduce Bighorn Sheep to Mineral King, Followed by Three Years of Intensive Study:

According to procedures and techniques established by the California Department of Fish and Game, and presented in the interagency "Sierra Nevada Bighorn Sheep Recovery and Conservation Plan," between 20 and 30 bighorn sheep would be trapped from the Baxter Herd on its winter range, and transported by helicopter to potential winter range in the Great Western Divide east of Mineral King. At least 15 sheep, representing a cross-section of age and sex classes, would be fitted with radio-transmitting collars. The food habits, movements and migration, and natality and mortality of these sheep would be studied intensively for three years. Simultaneously, the status of vegetation in principal home range centers would be studied for the same period. At the conclusion of the intensive research period, herd and vegetation status would be monitored indefinitely by the Division of Resources Management.

4. RECOMMENDED COURSE OF ACTION:

It is recommended that the introduction and research described begin in the spring of 1988, sheep population and weather conditions permitting. We expect that execution of the relocation and subsequent research will take three years. This research will be conducted under the direct supervision of the Research Scientist, either by Park personnel or by cooperative agreement through the Cooperative Parks Studies Unit.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. Funds Requested - $50,000 year one and $40,000 for years two and three.

C. Funding Source Requested - Regionwide Natural Resource Base.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-23-COMPLETE INVENTORY OF AQUATIC RESOURCES:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

There are about 2,650 lakes and ponds and thousands of miles of mapped rivers and streams within these Parks. Yet very little of this resource has ever been surveyed or studied. At a glance, the studies listed below seem like a significant amount of data; they provide very useful information. However, most of them were very limited in scope, being oriented at very specific problems. Techniques often were not comparable; and viewed holistically, all of the data combined provide a very sketchy description of the aquatic resources. Also, without a comprehensive inventory, there is no way to know how representative a particular site is of other park areas. One comprehensive survey is needed to measure the physical and chemical characteristics and biotic structure of each of the aquatic environments. This survey shall include lakes, ponds, rivers, streams, ephemeral pools, intermittent streams, wet meadows, warm springs, cold water springs, seeps, soda springs, cave pools and streams, snow pack, and ground water.

(1) Goal:

Survey and classify each of the Parks aquatic environments.

(2) Objectives:

a. To inventory and classify aquatic environments by physical and chemical characteristics and biotic communities present.

b. To identify both common and unique aquatic systems.

c. To make recommendations regarding the location of long-term monitoring sites, the frequency at which they should be surveyed, and what should be surveyed.

d. To identify potential and unknown existing aquatic resources management problems.

e. To make management recommendations regarding aquatic resources.

B. Past Actions:

The U.S. Geological Survey sampled 65 stream sites in 1978-79 primarily for major constituents; Zardus, et al. (1977) sampled the fish fauna in 137 lakes in 1977; Bradford et al. (1968) sampled 101 lakes for trace elements in 1965 and is repeating surveys in 1980-83; Dana Abel surveyed much of the Kaweah drainage for aquatic insects; Dennis Kubly (1983) and John Stoddard have surveyed plankton in many high lakes; John Melack measured pH and buffering capacity of lakes at several alpine sites; the Parks' water quality monitoring program has collected some data at 20 long-term monitoring stations and several facility-visitor use impact monitoring sites; and there have been several very local studies: the work of Don Erman and graduate students in the Rae-Sixty Lakes area; the current acid precipitation studies at Emerald Lake, Log Meadow, and Elk Creek; the effects of a forest fire on water quality (Hoffman and Ferreira 1976); a survey of visitor use impacts on two park lakes (James 1975); and water quality data collected in the Mineral King area by a variety of different agencies. Most recently, the acid precipitation studies begun in 1982 are contributing extremely detailed information on three areas representing subalpine mid-Sierran and foothill chaparral.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

These Parks will continue to be unaware of the true nature of aquatic resources. Some management problems or potential problems may never be discovered, and sites selected for long-term monitoring of these resources may not be properly located. Unique, rare, or extremely fragile aquatic resources could be altered without management even being aware that they existed.

B. Conduct an Intensive Survey of the Aquatic Resources:

This will provide a firm foundation for all future management and monitoring actions regarding aquatic resources. Such a survey will also identify future aquatic research needs.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes:

A. Research Actions:

Inventory and classify these Parks' aquatic environments for physical properties, chemical constituents, and biotic community structure and composition. Chemical sampling shall include major constituents, selected ions and trace elements biocides, and radioactivity. Biotic measurements will include productivity, community structure, and biota of special interest (e.g. fecal coliform bacteria).

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $40,000 per year for three years.

C. Funding Source Requested - Servicewide Water Resources Base.

6. REFERENCES:

Bradford, G. R., F. L. Bair, and V. Hunsaker. 1968. Trace and major element content of 170 high Sierra lakes in California. Limnology and Oceanography 13:526-530.

Hoffman, R. J., and F. F. Ferreira. 1976. A reconnaissance of the effects of a forest fire on water quality in Kings Canyon National Park, California. Open-file Report 76-497. U.S. Geological Survey, Menlo Park, California. 17p.

James, G. J. 1975. Effects of human activities on mountain lakes in California. Unpubl. Ph.D. dissertation. Univ. Calif., Irvine, California. 88p.

Kubly, D. M. 1983. Plankton of high Sierra lakes. Southern California Edison Research and Development Report No.83-RD-47. Univ. Calif., Riverside, California. 96p.

Zardus, M. J., T. Black, and D. Schulz. 1977. Status of fishes in 137 lakes in Sequoia and Kings Canyon National Parks, California. National Park Service unpubl. report. 96p.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-25-LONG TERM EVALUATION OF EFFECTS OF ACID PRECIPITATION ON SELECTED ECOSYSTEMS:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

Sequoia National Park is the site of a long term baseline research program on the effects of acid precipitation on Western ecosystems. This program is part of a major interagency research project designed to quantify both input levels and effects on Park ecosystems of acid rain, snow and dry deposition. The project has been funded at a level that allows implementation of long term research on precipitation chemistry and selected aquatic and terrestrial ecosystem parameters. In order to fully evaluate the ecological effects of acid precipitation it will be necessary to assure that this work be continued beyond the scheduled termination of the current program.

Available data on precipitation chemistry documents the fact that summer and fall precipitation events are often highly acidic and contain high concentrations of nitrogen and sulfur. In addition, the Sierra Nevada is especially susceptible to effects from acidic deposition due to its poorly buffered granitic soils and low alkalinity lakes and streams. The existing acid precipitation research program will allow more complete documentation of precipitation chemistry, as well as lake and stream chemistry and selected vegetation parameters. These studies are designed to collect long term baseline data which will be of value in determining the extent to which changes in ecosystem structure or function may occur. Existing funding is insufficient to assure the data base necessary to complete these studies. Plans must be made and funding secured to assure the continued evaluation and periodic re-assessment of key parameters. In addition, natural fires are an integral part of Sierran Ecosystems. Since fire is known to have profound effects on biogeochemistry, including soil pH and levels of nitrogen and other elements, it is essential to document the interaction of fire with acid precipitation.

B. Past Actions:

Sequoia National Park has been the site of an NADP monitoring station at Giant Forest since 1981. This station is part of a national network documenting the acidity and ionic concentrations of rain and snow. In 1982, Sequoia became one of four National Parks to be included in the National Acid Precipitation Assessment Program (NAPAP). Funding has been provided to implement selected basic long term research studies. In addition, such other groups as the USFS, USGS, NASA and the State of California are assisting in a cooperative effort to understand selected aspects of three major ecosystems in Sequoia National Park. Primary study sites have now been established in the chaparral, giant sequoia-mixed conifer forest and subalpine ecosystems.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Under the no action alternative the current research program would die with the termination of NAPAP. As a result, certain aspects of the total program would either not be implemented or fully carried out. A tremendous opportunity to fully document the long term impacts of acid precipitation across the elevation gradient found in the southern Sierra Nevada would be missed if no additional funds were made available to assure completion of ongoing studies. The lack of this additional information would limit conclusions regarding long term impacts which might occur within these Parks should current or projected increased levels of anthropogenic atmospheric contamination occur. If this alternative were chosen an opportunity to collect complete ecosystem data on potential impacts from acid precipitation would be lost.

B. Assure Completion of Scheduled Research Program:

Continuation of baseline studies on the effects of acid precipitation on ecosystems will be funded on a priority basis. Such data would allow for integrated analysis of long term impacts on park ecosystems. Emphasis on priority studies, including effects of acid precipitation on aquatic chemistry and biology, including stream biota and fisheries, precipitation chemistry, soil chemistry and microbiology, litter decomposition, and remeasurement of

long term vegetation plots would be adjusted on a yearly basis. Major attention would be given to periodic reassessment of earlier data sets, continued monitoring and analysis of input and output chemistry, and the possible implementation of selected new priorities. The completion and followup evaluation of these data sets for the three primary study sites will allow for integrated analysis and modeling of long term threats of acid deposition to park ecosystems as well as similar ecosystems around the world. Portions of the funding would go towards assuring full integration of the various studies and employment of a term appointment technician.

4. RECOMMENDED COURSE OF ACTION:

A. It is recommended that the funding called for in Alternative B be provided. Only this approach will allow for complete understanding of the susceptibility and potential effects of acid precipitation on park ecosystems. Since park ecosystems consist of complex interaction between a variety of species and trophic levels, it is important that no aspect be overlooked. For example, effects of increased acid deposition on forest productivity might prove to be a function of decreased nitrogen fixation by soil microorganisms. If nitrogen fixation rates are not understood, it could be impossible to predict future decreases in forest growth. All studies contracted under this program will be coordinated and integrated into the overall park research program on acid deposition. Funding will be required for a five year period.

5. FUNDING:

A. Recurrent Funds Available from National Acid Precipitation Research Program - $98,800; expect to continue through FY90.

B. O.N.P.S. Funds Requested - $60,000 for each of five years.

C. Funding Source Requested - Servicewide Acid Precipitation Base.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-26-ECOLOGY AND MITIGATION OF EXOTIC PLANTS:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

Exotic grasses and herbs, primarily of mediterranean origin,dominate the foothill grasslands and the understory vegetation of the oak woodland and mixed evergreen chaparral communities in the Parks. Exotic plants can also be found scattered through other park communities. Exotic ornamentals present in residential areas possess the potential for escape, especially in combination with the reintroduction of fire to nearby slopes. It is the responsibility of the Parks to determine the feasibility of eliminating those exotics and re-establishing native vegetation (NPS Management Policies 1978).

B. Past Actions:

An inventory of all Park resources, including plant species, is being conducted as part of a Geographical Information System. No studies have been conducted to determine the adaptation of alien species to current management regimes or to evaluate possible removal techniques.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

Without the proposed study alien species will continue to dominate many park plant communities. The possibilities of gradual or rapid expansion of exotic species in different areas of these Parks will be unknown. Park ecosystems will continue to not represent truly natural communities.

Required compliance with NPS Management Policies leaves no alternative but to inventory and study the biology and ecology of these species. Recommendations are needed as to the feasibility and costs of eliminating exotics and reintroducing native species.

4. RECOMMENDED COURSE OF ACTION:

All plant communities of the Parks will be inventoried for the presence and importance of exotic species. A thorough

literature review will be made to determine what is known about the ecology of those species. Experimental research will be conducted to determine the feasibility and most efficient techniques of eliminating introduced species and reestablishing native vegetation. This will include experimental prescribed burns of grassland and other herbaceous communities, physical removal of individual plants, and the potential for success using herbicides. Following completion of the experimental work, a plan will be written analyzing the feasibility of removing exotic species from various park plant communities. The study will be conducted over a four year period.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $26,000 per year for each of the four years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-28-SUPPORT FOR LONG-TERM RESEARCH:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

The research program in Sequoia and Kings Canyon has developed into one of the most comprehensive in the National Park Service. In addition to the personal research projects of Western Regional Office scientists duty stationed in the parks major effort has been given to attract cooperative funding necessary to fully understand the significance of park resources. In the last couple of years, this effort has successfully in attracted attention and project specific funding from the National Acid Precipitation Assessment Program, the California Air Resources Board, the University of California, the U.S. Forest Service, the U.S. Geological Survey, the Electrical Power Research Institute, National Aeronautics and Space Administration, the Southern California Edison Co. and Oak Ridge National Laboratory. There has also been a dramatic upswing in interest among university scientists to work in the Parks.

While this surge of research activity in the Parks promises exciting advances in the understanding and management of sensitive park resources, including documentation of threats and impacts as well as the development of long term data bases for future monitoring, it has created a severe stress on the available science staff. Support capabilities, including the greatly expanded demands for logistical facilitation, administrative help, maintenance of computerized data bases, program monitoring and regular interaction with funding agencies and principal investigators to maximize relevance of results and assure compliance with NPS policy have severely taxed the available support staff and budget. The resident scientists have been increasingly drawn away from their own areas of scientific expertise. Additional support is required to assure the capability of carrying out long-term baseline studies.

B. Past Actions:

The Park administration has provided part-time secre-

tarial support for two research scientists. This support level assumed that the scientists would conduct personal projects in their respective areas of expertise as well as coordinate outside research going on in the park. There is no provision for extensive time commitments to the type of research administration and facilitation now required. There is no Park Service staff available to handle the complex computerized data bases being developed for the natural resources of the Parks. The parks have no funds available to specifically support such activities.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

This alternative would require that a decision be made whether (1) one or both of the resident scientists should be converted essentially to full time research administrators or (2) the Parks de-emphasize cooperative research and return to the days when only a couple of major research projects are underway at any given time.

B. Provide Base Support for Research Program:

Increased clerical and technician staff as well as support costs will relieve much of the current strain on the resident scientists allowing them to again give increased attention to their assigned professional duties. Clerical assistance would relieve much of the stress on maintaining correspondence, data, and reprint files, and would assist in data entry and storage on the Park computer system. A Biological Technician (GS-401/07) would handle routine administrative matters such as seasonal personnel, housing needs, vehicles and field sampling schedules as well as managing databases, conducting directed data analysis and other computer operations, and operating a variety of technical equipment. The continuity provided by such a position is essential.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is recommended. This will provide the Parks with needed base support to continue the type of integrated, co-operative research program that is proving so valuable.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $33,000.

C. Funding Source Requested - Park Base.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-29-ACQUIRE NATURAL RESOURCE INFORMATION SYSTEM:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Initiation of most research, resources management, and construction projects requires collection of local baseline data in the absence of an existing geographic information system, and once so collected, frequently is not or cannot be used for the next such project. Monitoring of resource changes is similarly frustrated by the lack of an information infrastructure that can be easily, economically, and reliably accessed. Anticipation of resource problems is often impossible, yet prompt response to urgent problems is blocked by absence of systematic baseline data in accessible form. Recent realization by scientists and managers of the insidious nature of such threats as acid precipitation, air pollution, fire suppression, and boundary effects has made the absence of a modern data collection/management/evaluation system all the more dangerous for Park resources.

There is presently a "Geo-based Resources Information System" database (N-21) under development in these Parks. Information is being collected from existing sources, fieldwork, remote-sensing, and digital cartography. This data acquisition and integration program began in 1985 and will take at least five years. Existing hardware and software at SEKI, however, is capable of processing only a small portion of such data: relatively small datasets in conventional (e.g. relational database) non-graphical representations. Under these constraints, utilization of the great power of geographic information systems is not possible, nor is access to much valuable information.

B. Past Actions:

A bibliography of research conducted in the Parks has been developed and is continuously updated. Collection of baseline resource information that will eventually cover all areas of both Parks began in 1985. A cooperative arrangement was made with the Geological Survey for shared-cost of digital cartography products for the GIS.

Determination of the best existing Landsat thematic-mapper scenes of SEKI was completed. Collection, evaluation, hand-mapping, and computer data base entry of GIS themes began in 1985. The GIS Field Unit contracted for the development of GIS software to run on local Park computer workstations.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Baseline data collection will continue, with storage of non-map databases on existing Park computing system. Piecemeal ordering and acquisition of digital cartography will begin in 1986 and will take at least 10 years to complete; such products will not be accessible to SEKI but will be stored on the GIS-FU computer database. Similarly, Landsat images will be acquired over several years, and stored at GIS-FU. Only exploratory map analysis of small datasets will be feasible locally.

B. Acquire a Computer Workstation Appropriate to the Parks' Geo-based Resources Information System; Install Programming Developed by GIS-FU and Other Sources; Acquire Digital Cartography and Landsat Scenes Covering Full Area of SEKI and Incorporate These as the Core Data Sets:

This information system is the appropriate scope for the size, complexity, and value of Park natural and cultural resources. It would lead to more secure protection of resources, and greater efficiency in monitoring and future planning by all Park Divisions. Planned compatibility with systems in Yosemite and at the GIS Field Unit would greatly improve comparisons and help lead to system-wide resource tracking.

4. RECOMMENDED COURSE OF ACTION:

The resource information system described should be acquired and made fully operational as soon as possible. Acquisition and installation of computer workstation and associated software, and of remaining cartographic products and Landsat data will take two years. This project will be directed by the Research Scientist in consultation with other Park Divisions and the Geographic Information Systems Field Unit (GIS-FU).

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - (First year) $88,000 ($73,000 for acquisition of digital cartography and remote sensing; $15,000 personal services for digitizing and ground truth of remote sensing). (Second year) $70,000 for workstation hardware and sofeware acquisition.

C. Funding Available in Parks Base - $38,000/year for Data Acquisition and System Maintenance.

D. Funding Source Requested - Servicewide Natural Resource Preservation Base.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-30-ASSESS AIR POLLUTION THREATS TO SENSITIVE FOREST ECOSYSTEMS:

2. STATEMENT OF THE PROBLEM:

Atmospheric depcsition of pollutants to natural ecosystems is one of the most serious threats facing our national parks. Man-caused pollutants that are thought to have the potential for serious impacts on natural ecosystems in California's parklands include gasses such as ozone and sulfur dioxide, as well as dry deposition of particulates and trace elements. While Sequoia and Kings Canyon are monitoring ozone levels and visibility at selected sites and are participants in the long-term National Acid Precipitation Assessment Program (NAPAP), additional studies are needed to fully document air pollution threats to sensitive park ecosystems.

It has been well documented that the Sierra Nevada is especially sensitive to inputs of atmospheric pollutants due to its poorly buffered granitic soils and drought stressed vegetation. Ongoing studies have confirmed the presence of damaging ozone concentrations. In order to fully document pollutant inputs and potential threats such studies must be expanded to include an understanding of dry deposition inputs, through fall chemistry, atmospheric concentrations of toxic trace pollutants and trace pollutant levels in water, soil, litter, vegetation and fauna. A comprehensive survey of symptoms found on potentially sensitive plant species as well as a thorough understanding of the effects of such natural stresses as drought and competition on sensitivity to air pollution are also needed.

The concept of focusing atmospheric pollution research and monitoring in the Sierra in Sequoia National Park has received support in recent years from a variety of government and private organizations. This support has included cooperative participation and funding from NASA-Ames, the California Air Resources Board, Southern California Edison Co., the Electrical Power Research Institute, the U.S. Forest Service, NOAA, MAB and the University of California. The proposed project will be coordinated to assure compliance with related interests of Yosemite and other California parks.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

While studies on ozone and acid precipitation impacts would continue, the important pollutant inputs and impacts of other toxic gases, trace elements and particulates would remain undocumented. The result would be an incomplete data base on air pollution threats to sensitive Sierra ecosystems. A thorough understanding of such natural stresses as drought and competition that is necessary to separate out pollutant impacts would be unavailable.

B. Carry Out Proposed Research:

Requested funds would be used to support research on one or more of the following: dry deposition monitoring, through fall monitoring, atmospheric concentrations of toxic gases and particulates, measurement of toxic trace element concentrations in key ecosystem components, a survey of air pollution damage to vegetation in major park plant communities, and baseline studies necessary to fully understand natural stresses, including competition, on forest and other plant communities.

Dry deposition studies would provide support for implementing state of the art collectors at the lower of the Parks' three long-term acid deposition watersheds to complement the mid-elevation dry deposition station. These would be supplemented by throughfall and stemflow studies of important shrub and tree species to serve as an index of deposition on vegetative surfaces. Atmospheric concentrations of gases, particulates and anionic species will be measured with low and high volume samplers at selected sites. Trace element concentrations will be analyzed for important plant species as well as litter, soil and water at each primary study site. A comprehensive survey of pollutant damage to plant species in major park ecosystems would be carried out.

Expanded studies of the interaction of pollutant and natural stresses should focus in the Jeffrey pine community where the most severe pollutant symptoms have been observed and in the post-burn chaparral areas where shrub seedlings may show ozone damage. Competition, water stress, needle retention, litter fall, needle morphology,

histology, and effects of ozone on photosynthesis and productivity would be addressed in a multidisciplinary study.

This study program will greatly expand the available data base on threats from atmospheric pollutants. The data will be of value to surrounding areas, including a number of other parks.

4. RECOMMENDED COURSE OF ACTION:

It is recommended that the proposed research be carried out (alternative B). This research will provide an essential data base for evaluating air pollution threats to sensitive park ecosystems. It will provide a firm basis for long term air pollution monitoring. The study will be carried out by Park, Air Quality and contract personnel over a five year period. The results will be of interest and significance to a number of other agencies, many of whom are now providing funding for related studies in the park. Final project objectives would be developed in conjunction with the NPS Air Quality division.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $54,000 per year for years one and two, $35,000 per year for years three, four and five.

C. Funding Service Requested - Servicewide Air Quality Base.

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-31-ESTABLISH LONG-TERM STUDY AREAS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Natural resources programs in Sequoia and Kings Canyon have traditionally focused on short term crisis research questions or the implementation of action management programs. Very little attention has been given to establishing a mechanism for collecting the baseline data necessary to evaluate the long term health of key Park ecosystems. No long term study plots have been established in which systematic monitoring of plant, animal and soil communities will be carried out over the long haul. Without systematic data on key ecosystem properties it is often impossible to document changes or problems when they first occur. Park interpretive programs are also limited in their understanding of Park ecosystem processes.

B. Past Actions:

A minimal effort is planned to document all past studies in the Parks that have included any permanent plots or transects. While these examples may prove of some value to future documentation of problems they do not represent a systematic approach towards even dominant species in key ecosystems.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If permanent long term study areas are not established there will be no effective means of determining future trends in the health of key park ecosystems. Long term impacts from such identified threats as air pollution and visitor use will remain essentially undocumented for many key park communities.

B. Establish and Carry Out Systematic Monitoring of Long Term Study Areas:

Under this alternative a series of one to 10 hectare

permanent baseline study areas will be established in each of eight to ten key ecosystem types across the elevation gradient encompassed by the Parks. These will include chaparral, foothill woodland, mixed evergreen forest, ponderosa pine, sequoia mixed-conifer, red fir, lodgepole pine, mixed sub-alpine forest and alpine communities. Consideration will be given to utilizing the current Research Natural Area concept and the ongoing Geographic Information System Project as a basis for locating the study areas.

A systematic inventory strategy will be developed to document micrometeorology, plant species composition and diversity, vegetation structure and phenology, soil structure and chemistry, species and abundance of vertebrates and invertebrates using the area, as well as other potentially interesting ecosystem characteristics. A long term monitoring program will be devised to detect possible future change.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is recommended. This will, for the first time, provide the Parks with a systematic data base for understanding selected key park ecosystems. It will provide the basis for a long term monitoring program to detect possible threats or impacts to important park resources. The study will require four field seasons. It will be conducted by park staff in cooperation with the CPSU at UC Davis. The followup monitoring will be carried out under a proposed resources management program.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $53,000 for each of four years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-32-SOCIOLOGICAL STUDIES OF PARK VISITORS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

National Park Service officials estimated that foreign visitors comprised 10 percent of the visitors to National Park System units in 1981 (Dateline NRPA 1981). Recently, sociological research in Grand Canyon National Park (GCNP) found 33 percent of all visitors to that Park were foreign visitors (from 112 different countries around the world). Furthermore, it was demonstrated that many foreign visitors at GCNP do not understand campground or road rules, and little is known of how satisfied they were with their visitation, experience, or what could be done to make their visits more enjoyable, meaningful and educational.

In addition to a general increase in foreign visitation, California, and, in particular, the Central Valley has experienced a recent influx of Southeast Asian and other foreign peoples. Many of these people are now visiting the Sierran parks. Little is known about the sociological aspects of park visitation by foreign people and thus park staff and programs are ill-equipped to deal with them. It is unknown how successful the park is in fulfilling visitor expectations.

Likewise, the sociological aspects of backcountry visitation has not been surveyed since 1975. At that time strong visitor support was found for backcountry management regulation (and enforcement) and the development of an "eco-consciousness" by backcountry visitors was documented. This information was instrumental in developing "minimum impact" regulations and backcountry management objectives. Since 1975, however, many changes in backcountry management have taken place. Wilderness permit reservation systems and trailhead quotas have changed, as have many internal regulations (wood fire closure areas, campsite closure areas, stock use regulation, one-night camp limit areas etc.). Little is known of how todays backcountry visitors are effected by these management changes in terms of visitor satisfaction, requirements for solitude, or general park experience.

B. Past Actions:

Past sociological studies in Sequoia and Kings Canyon National Parks have been limited to a few small scale survey type studies and a wilderness permit compliance survey. No comprehensive study of park visitors and their expectations have been carried out.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If the study is not carried out, park management and interpretive programs will continue to be insensitive to and unaware of the needs and expectations of park visitors.

B. Carry Out Proposed Research:

Develop and carry out questionnaire and interview based studies designed to assess visitor demographic characteristics, level of knowledge of park management objectives and regulations, preferences and expectations, and visitor perceptions of the role and effects of park management (Interpretation, Fire Management, Research, Resources Management, Visitor Protection etc.) on their visit. A separate survey of backcountry visitor expectations and opinions should also be carried out. The first portion of the study should include Yosemite National Park. The program will include formal training for park personnel to reflect study findings.

4. RECOMMENDED COURSE OF ACTION:

It is recommended that the research identified under alternative B be carried out in conjunction with Yosemite National Park. The studies would be contracted to university or Park Service scientists.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $50,000 for each of two years.

C. Funding Source Requested: Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-33-STUDY MARMOT BEHAVIOR:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

In recent years, yellow-bellied marmots (Marmota floviventris) have become a management problem during the late spring and much of the summer. Marmots enter the engine compartment of parked cars and chew on electrical wires and radiator hoses. Some of the owners are already heading home and a long way from help before the problem is discovered. Besides causing costly damage and inconvenience, there is potential risk to safety. For instance, marmots could chew through a flexible brake line and, on one occasion, they damaged Mineral King's fire truck. Marmots also damage wooden buildings and other wooden objects. Some of the summer residents are concerned about getting diseases from marmots living under their cabins.

Recently marmots causing problems were destroyed. This is not an acceptable long-term solution within a National Park.

(1) Goal:

To prevent marmots from damaging automobiles and maintain their natural ecological niche.

(2) Objectives:

a. To determine the basis of the behavior.

b. To develop and test management recommendations.

B. Past Actions:

To date, the only technique that has provided any control of the problem has been destruction of individuals that attempt to enter cars. Use of ultra-sound, harassment, relocation and baiting marmots away from parking areas using salt blocks and old hoses was ineffective. Attaching wire to the bottom of some local vehicles did provide

some help for those few vehicles. Efforts to keep cars out of the worst parking areas provided some help, but this is not practical when use is high, it creates logistics problems, and we are running out of safe areas as the problem expands. In 1985, preliminary investigations by Resources Management staff and a CPSU literature search and preliminary investigation suggested that electrolyte or mineral deficiency during spring and early summer causes this behavior. Several possible means of mitigating this behavior were proposed.

3. Alternative Actions and Their Probable Impacts:

   A. No Action:

      Marmots will probably continue to damage automobiles.

   B. Kill Problem Marmots:

      This has questionable short-term value and is certainly inappropriate for long-term management within a National Park.

   C. Investigate the Cause of the Problem and Use This Information to Develop and Test Potential Management Techniques:

      This alternative would seek a solution based on the cause rather than simply combating the symptoms. Since the problem is reported to be of recent origin, the cause could be anthropogenic. If the cause is of natural origin and cannot (or should not) be the focus of a management solution, then this knowledge will direct developing and testing other potential solutions.

4. Recommended Course of Action:

   Alternative C which includes:

   A. Research Actions:

      (1) Formulate and test hypotheses regarding the cause of the Mineral King problem.

      (2) Develop and test (as appropriate) management recommendations for Mineral King. Formulate final recommendations.

(3) Learn more of the local ecology and distributioin of marmots.

5. Funding:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $15,000 for each of two years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-34-INVESTIGATE COWBIRD INVASION IN SEKI:

2. STATEMENT OF THE PROBLEM:

A. Current Conditions:

Historical park records, published literature, and staff observations indicate that brown-headed cowbirds were rare in the southern Sierra Nevada 50 years ago, are now locally common, and that the change may be the result of human habitat modification both inside and outside the Parks. Published literature suggests that cowbird range expansion has contributed to marked declines in several species of passerine birds parasitized by cowbirds; local observations indicate this may be happening in the Parks as well. Consequently, it is possible that human activities within the Parks are leading to the population increase and range expansion of a bird species not native to this area, and the consequent decline of native bird species already greatly reduced in population throughout the State.

(1) Goal:

To determine if cowbirds are functioning as an anthropogenically-induced exotic species, if they are expanding in population or range within the Parks, if they are having a significant impact on any native bird species, and what--if any--means of reversing or mitigating this (proposed) problem are appropriate.

(2) Objectives:

a. Determine population centers, movements, and estimate numbers of cowbirds in Parks.

b. Survey nesting populations of candidate parasitized bird species for breeding density and pattern of cowbird parasitism.

c. Determine relationship between cowbirds and human activity within Parks.

d. Evaluate alternative methods of controlling

cowbird numbers through direct reduction and habitat modification.

B. Past Actions:

Park staff have observed and recorded cowbird numbers and movements at a few population centers. A preliminary literature search was conducted.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE CONSEQUENCES:

A. No Action:

The degree and nature of the proposed cowbird invasion will remain unknown, as will its effects on native Park birds. It is possible that local extirpation of one or more native birds could result from an exotic invasion induced in part by Park activities.

B. Implement Control Actions Without Research Data:

Attempts would be made to reduce cowbirds by direct reduction in combination with habitat modification. This would entail killing a bird that might be experiencing a natural population expansion rather than an artificially-induced one; modifications in campgrounds, picnic areas, and stock stations would be resisted without data justifying such actions; and the effort could well be ineffective in any case.

C. Execute Cowbird Ecology Research:

The nature of the situation would be determined before any resource-modifying actions were taken; the most effective control actions would be determined in advance.

4. RECOMMENDED COURSE OF ACTION:

Alternative C: Execute a program of cowbird ecology and control research to determine the nature of the problem and its possible solutions.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $25,000 per year for three years.

C. Funding Source Requested - Regional Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-35-SOIL SURVEY OF SEQUOIA AND KINGS CANYON NATIONAL PARKS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Little is known about the distribution, morphology, chemistry or vertical zonation of soils within the Parks. Concerns over negative impacts of acid deposition on terrestrial and aquatic ecosystems have increased. It is known that some of the most sensitive ecological systems occur in rocky and/or mountainous regions where soil development is minimal. In addition, basic information on soils (i.e. characterization, classification and mapping) is needed to fully understand the distribution of plant communities (e.g. giant sequoias, rare and threatened species, alien plants, etc.) in the Parks. General soil classification surveys are underway on all U.S. Forest Service lands surrounding the Parks, leaving Sequoia and Kings Canyon the only land unsurveyed in the southern Sierra Nevada.

B. Past Actions:

Less than 63,000 acres (less than eight percent) of the Parks' 850,000 plus acres have been surveyed to date for basic soils characteristics.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If baseline soil surveys are not carried out Park managers will be unable to assess the extent of potentially sensitive soil types to acid deposition within the Parks. Likewise, they won't fully understand the edaphic controls on plant community distributions and how soil resources may be affected by management actions (i.e. trail building, prescribed fire, etc.).

B. Carry Out Soil Surveys:

Pedological surveys should be carried out to

characterize, classify, and map all areas of the Parks that have not been inventoried. A systematic "Order 3" or "Order 4" type survey, similar to that of the surrounding Forest Service areas should be conducted. Soils should be morphologically analyzed and mapped to phases of soil sub-groups. Resulting maps should be digitized to incorporate into the Parks' GIS survey of Park resources. The above information will serve as an important baseline to evaluate potential effects of acid deposition, and develop an understanding of the relationship between soil characteristics and plant community distributions.

4. RECOMMENDED COURSE OF ACTION:

It is recommended that a baseline soil survey identified under alternative B be carried out. It is anticipated the survey will be carried out over a five year period by contract personnel.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $50,000 per year for five years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-36-BLACK-TAILED HARE REINTRODUCTION STUDY:

2. STATEMENT OF PROBLEM:

   A. Current Conditions:

      Black-tailed hares (Lepus americanus) are believed native to but no longer observed in Sequoia and Kings Canyon National Parks. They are believed to be extirpated from the Parks and surrounding areas, although this has not been established with certainty.

   B. Past Actions:

      A small population of black-tailed hares was extant in the Ash Mountain area until 1918, when it disappeared at the same time as a poisoning campaign against ground squirrels.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

   A. No Action:

      Without further investigation, no determination of the actual status of this species is likely, and no further consideration of restoration can be made.

   B. Determine Present Natural History, Status and Distribution of Blacktailed Hares:

      If reintroduction is feasible and reasonable follow this by reintroduction and intensive monitoring/ecology study.

4. RECOMMENDED COURSE OF ACTION:

   Project as described above.

5. FUNDING:

   A. Recurrent Funds Available in Parks' Base - None.

   B. O.N.P.S. Funds Requested - $15,000 year one (status and distribution); $15,000 year two (status and distribution, procedures for reintroduction if appropriate); $20,000 years three through five (if reintroduced).

C. Funding Source Requested - Regionwide Natural Resource Base.

Natural Resources Management Program
Sequoia and Kings Canyon National Parks

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-37-POPULATION DYNAMICS OF SUBALPINE FORESTS:

2. STATEMENT OF PROBLEM:

Little is known about the population dynamics of subalpine forests yet management actions such as allowing prescribed natural fire to burn or controlling visitor use patterns, etc., may directly effect the forests. Even baseline information on the role of fire in these systems is lacking. Without adequate information on establishment and mortality rates, size and age class distributions, and the effects of fire of vegetation structure, we are unable to fully evaluate management related impacts to these ecosystems. We will also be unsure how to react should high intensity natural fires occur.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Baseline data on key ecological parameters and population dynamics of subalpine forests would not be collected. Managers would not be able to fully evaluate management impacts or potential for extreme fire behavior in these ecosystems.

B. Study Population Dynamics of Subalpine Forests:

Baseline data on key ecological parameters and population dynamics of subalpine forests would be collected. Ecological parameters would include fire history, fuel accumulation, fuel moisture, litter decomposition and fire behavior. Population dynamics information would include seedling and establishment rates, natural and fire-caused mortality rates, and size and age class distributions. Key forest types to be examined include lodgepole pine, white bark pine, western white pine and foxtail pine. Impacts associated with fire and visitor use would be evaluated for each forest type.

The information gained from such a study could be direct input to the Parks' Fire Management and Vegetation Management Plans and would allow managers to make informed decisions on prescribed natural fire and wilderness management.

4. RECOMMENDED COURSE OF ACTION:

Alternative B is recommended. Completion of the study will assure visitor use management and fire management actions will minimize unacceptable impacts to the sensitive backcountry resources. The study would be conducted over a four year period.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $29,000 per year for each of four years.

C. Funding Source Requested - Regionwide Natural Resource Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-38-FIRE ECOLOGY OF TRANSITION FORESTS

2. STATEMENT OF PROBLEM

A. Current Conditions:

The fire management programs for Sequoia, Kings Canyon, and Yosemite National Parks call for the use of prescribed fire to reduce unnatural fuel accumulations as a prerequisite to restoring natural fire regimes. While some attention has been given to understanding the role of fire in low elevation chaparral and middle elevation giant sequoia-mixed conifer areas, information on the role of fire in the transition forests between the two is extremely limited. At this time, there is no information on the fire regime, the effects of fire and fire suppression on the structure and function of lower mixed conifer-oak woodland forests, or the extent of unnatural or atypically high fuel loadings that might now occur in those zones. Information is scant on litter (fuel) accumulation and decomposition rates, fuel moisture and fire behavior.

In addition, the Parks' fire management programs are in need of quantitative standards to guide decision making on if, where, when and how to burn in these forest types. Fires can originate from lightning strikes on ridges above the transition zone (e.g. in the giant sequoia-mixed conifer type) and burn down slope, or from the highly flammable chaparral areas below them.

The chances of doing a creditable job of restoring fire to its natural role in and between these vegetation types is seriously impaired without this basic information.

B. Past Actions:

Limited fire history data is available from fire scar records in giant sequoia forests but there is not similar data from the foothill mixed evergreen-lower mixed conifer forest communities. Pre- and post-burn data has been collected for some lower elevation pine dominated forest types in Yosemite, but no systematic analysis of the data has been done to date.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

If the proposed research is not carried out, Park managers will not be able to restore fire to its natural role in and between the Parks' major vegetation types. They will not be able to adequately assess the threat of wildfire to the giant sequoia forests from the lower elevations or the need for fuels management prior to the restoration of natural fire, which in turn, will affect fire prescription/suppression decisions. Ultimately, catastrophic fires, loss of facilities and primary resources and threats to human safety could result from insufficient fire management.

B. Carry Out Research on Fire History and Ecology of the Lower Mixed Conifer-Foothill Evergreen Woodland Communities:

It is proposed that a several faceted study be undertaken.

Past fire history as well as present fuel loading and species composition will be inventoried. Fire behavior relative to fuel loadings, topography and weather data will be quantified as input for developing prescriptions for the fire management program. Existing pre- and post-burn plot data will be analyzed and summarized and additional fire effects monitoring plots will be established where needed. Litter accumulation and decomposition rates and changes in forest structure will be monitored for four years.

4. RECOMMENDED COURSE OF ACTION:

It is recommended that alternative B be selected: that the proposed studies be carried out. The studies should be closely coordinated and integrated with needs and staff in Yosemite.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $24,000 per year for each of four years.

C. Funding Source Requested - Regionwide Natural Resources Base (Research).

NATURAL SCIENCE PROJECT STATEMENT

1. SEKI-N-39-MUSEUM FAUNA COLLECTION:

2. STATEMENT OF PROBLEM:

   A. Current Conditions:

      The scientific reference collection of Park fauna is tiny and almost useless. Present and future baseline data collection and monitoring programs (including the current Acid Precipitation and the Geo-based Resource Information System projects) require accurate identification of study subjects to be truly effective; in many cases only local specimens can reliably serve this purpose.

   B. Past Actions:

      The present SEKI reference collection of animals consists of a very few specimens of mammals, many not even collected in the Parks, comprising about two cases. There are small collections of some insect orders. Some specimens are deteriorating from inadequate preparation and care.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

   A. No Action:

      With faunal collections in their present condition, inventory and monitoring efforts that include some groups of animals either will be consigned to utilize only identification guides--leading to occasional identification errors and insensitivity to intra-specific variation and unpublished taxonomic or distributional conditions, or will have to utilize collections at the University of California and the California Academy of Sciences. This will be expensive in terms of time and travel, and not fully satisfactory as an alternative because collections for the southern Sierra Nevada are quite incomplete.

   B. Develop a Properly Curated Museum Collection of Appropriate Faunal Taxa, Including Mammals, Birds, Reptiles, Amphibians, and Arthropods:

      Rather than attempting to collect and maintain all organisms from these groups, we would concentrate on taxa of

interest: Species difficult to identify (or of uncertain taxonomy, species endemic to the Parks, species undergoing change in status, species used as monitoring indicators, etc.). This museum project would actually consist of several activities: Acquisition of the appropriate storage facilities (trays, cases, etc.), specimen collection, specimen identification and preparation, and curation.

4. RECOMMENDED COURSE OF ACTION:

Develop a limited faunal collection as described over a period of five to 10 years, and maintain properly indefinitely.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $10,000 year one (remodel vacated Sequoia Natural History Association warehouse space, purchase specimen cases and other museum supplies, purchase traps); $25,000 per years two through six (GS-7 LFT, GS-4 seasonal for collection, preparation, and curation); $10,000 year seven - indefinite (collection maintenance).

C. Funding Source Requested - Park Base.

NATURAL RESOURCE PROJECT STATEMENT

1. SEKI-W-1-STUDY IMPACTS OF SEWAGE SPRAYFIELD ON MID-SIERRAN STREAMS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

There are several sewage treatment plants in Sequoia and Kings Canyon National Parks. The older plants have an advanced form of primary treatment and new plants process sewage by secondary treatment. The processed wastewater is returned to the environment at sprayfields. Though the water is treated to remove pathogens, the water is rich in nutrients.

Nutrient concentrations in mid-Sierran granitic-soils are typically very low. Though secondary treatment of effluent may meet health and safety standards, there may be unacceptable effects on the natural aquatic environments. At the Giant Forest facility, measurable nutrient enrichment occurs at least downstream from the sprayfield.

(1) Goal:

Protect Park waters from nutrient enrichment caused by facilities.

(2) Objectives:

a. To study the limnologic effects of the effluent from a sewage facility using secondary or primary treatment.

b. To evaluate the duration and reversibility of sewage impacts should input be terminated.

c. To evaluate potential benefits and impacts of tertiary treatments in the same environment.

d. To make recommendations regarding the most significant environmental monitoring that should be done at sewage facilities.

B. Past Actions:

Related studies were done in the Lake Tahoe basin, but there is a general lack of such studies elsewhere in the Sierra Nevada. The existing environmental assessments for developments involving sewage facilities within these Parks contain little to no substantive information regarding environmental impacts of either secondary or tertiary facilities. There has been some intermittent water quality monitoring downstream the Giant Forest sprayfield since December 1982 and at the Clover Creek sprayfield since the fall of 1982.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

Without this study, we will continue to not know how we are altering the natural system that we are mandated to protect, and we will continue to propagate possible mistakes of the past.

B. Study Effects of Sprayfield:

Park management would have a better understanding of the extent and duration of adverse ecological effects associated with secondary sewage treatment in the mid-Sierran environment. Such information could be important when making decisions about what types of facilities to install in the future (secondary versus more expensive tertiary treatment), and whether existing facilities should be upgraded.

4. RECOMMENDED COURSE OF ACTION:

Alternative B which includes:

A. Monitoring Actions:

Conduct a thorough study of the environmental effects of an existing sewage facility. The study should:

a. Identify the extent of measurable effects during mid-winter, late spring-early summer high-flow conditions, during late summer minimum-flow conditions, and following major fall storms;

b. Compare density and diversity of benthic invertebrates and periphyton taxa in affected area with nearby controls;

c. Quantify major constituents and selected trace elements in affected and unaffected areas; characterize seasonal changes;

d. Measure nutrients and other selected ions in the soil at both an old abandoned sprayfield and in a nearby active sprayfield; evaluate the effects of the abandoned sprayfield on water quality, and estimate how long the abandoned site may be causing measurable effects on downstream aquatic communities after it is abandoned;

e. Make recommendations regarding the placement and level of treatment at future sewage facilities in these Parks;

f. Make recommendations regarding environmental monitoring at sewage facilities.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $36,000 per year for three years.

C. Funding Source Requested - Servicewide Water Resources Base.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-W-4-IMPLEMENT FLOODPLAIN STUDIES IN DEVELOPED AREAS:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Executive Order 11988, Floodplain Management, requires that "Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain," and consider alternatives if the action would be within the floodplain. "If property...is located in an identified flood hazard area, the responsible agency shall provide on structures, and other places where appropriate, conspicuous delineation of past and probable flood height in order to enhance public awareness of and knowledge about flood hazards." There are also many other requirements (e.g. construction standards) pertinent to areas within the floodplain.

These Parks have several major developments in low valley bottoms or with rivers and streams flowing through the developed site. Areas of particular concern are Cedar Grove, Lodgepole, Mineral King, and Buckeye Flats. In some areas some campsites have been reported to flood. The location of the 100-year and 500-year floodplains are unknown.

(1) Goal:

Determine the location of all 100 and 500-year floodplain boundaries.

(2) Objectives:

a. To conduct floodplain studies in a developed area of concern and in other areas where management actions may be affected by flooding.

b. To prepare maps delineating 100 and 500-year floodplains.

B. Past Actions:

Some employees thought that some floodplain work may have been done here, but no records were found in park files

or through inquiries to the Western Regional Office.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

A. No Action:

This could result in violation of EO 11988, particularly if there is any future construction at any of the areas of concern; and floodplain hazards will continue to be poorly known.

B. Conduct Floodplain Studies of Entire Park:

Such studies would certainly make it possible to meet the requirements of EO 11988. However, such a study would probably far exceed the true management need and could be cost-prohibitive.

C. Conduct Floodplain Studies of Developed Areas of Concern and other Selected Areas:

Such studies would provide for the most cost-effective approach to complying with EO 11988 and providing for public safety.

4. RECOMMENDED COURSE OF ACTION:

Alternative C which includes:

A. Research Actions:

Conduct a thorough floodplain study in each developed area of concern and other areas selected by management.

5. FUNDING:

A. Recurrent Funds Available in Parks' Base - None.

B. O.N.P.S. Funds Requested - $30,000 per year for two years.

C. Funding Source Requested - Servicewide Water Resources Base Program.

NATURAL RESOURCES PROJECT STATEMENT

1. SEKI-W-6-MEASURE IMPACT OF PEOPLE ON BACKCOUNTRY LAKES:

2. STATEMENT OF PROBLEM:

A. Current Conditions:

Sometimes over 40 people per night camp by some of the more heavily used backcountry lakes during the summer. Because these lakes are located in high elevation granitic basins, their waters have extremely low natural concentrations of nutrients and other ions. The natural ecology of such ultra-oligotrophic environments is extremely vulnerable to adverse modification by anthropogenic contaminants such as feces, urine, soap, and dishwater. Furthermore, there are less conspicuous impacts such as the stirring of bottom sediments by swimmers and waders; this liberates nutrients, increases turbidity, and dislodges benthic flora. In addition to ecological impacts, aesthetic impacts include social trails, denuded campsites, litter, and health hazards caused by human waste. At some of the lakes, the impacts are not only caused by visitors, but also by their pack animals.

(1) Goal:

To manage human use of backcountry lakes for compatibility with preserving integrity of the natural environment and maintenance of their pristine appearance.

(2) Objectives:

a. To monitor effects of human use on nutrient concentrations, productivity, benthic fauna, fecal bacteria, and aesthetic characteristics.

b. To monitor the quantity of human use at each monitoring site.

c. To determine carrying capacity and mitigating measures for lake sites.

B. Past Actions:

Preliminary investigations were done in 1983 and 1984 at

two backcountry lakes that receive heavy use relative to other backcountry lakes and at nearby controls that receive virtually no visitation. The one lake (Guitar) receives heavy backpacker use, and the other lake (Forester) is often visited by stock parties during the summer.

3. ALTERNATIVE ACTIONS AND THEIR PROBABLE IMPACTS:

   A. No Action:

      The effects of current management practices on one of the more fragile backcountry resources will continue to be unknown. Since adverse impacts often are not empirically detectable, serious management problems could be perpetuated because they were never investigated.

   B. Monitor Effects on Human Use on Representative Backcountry Lakes:

      These Parks would acquire information useful for establishing carrying capacities at popular backcountry lake sites. It will also help evaluate the effectiveness of mitigating measures, such as use of pit privies.

4. RECOMMENDED COURSE OF ACTION:

   Alternative B which includes:

   A. Monitoring Actions:

      To monitor levels of human use and effects on water quality constituents at several backcountry sites representative of a gradient of different levels and types of human use.

5. FUNDING:

   A. Recurrent Funds Available in Parks' Base - None.

   B. O.N.P.S. Funds Requested - $23,000 for two years.

   C. Funds Source Requested - Servicewide Water Resources Base.